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Editors: H. J. LAM, M. A. DONK, R. A. MAAS GEESTERANUS

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NOTES ON THE MELIOLALES

K. B. Boedijn
The Hague

(With 24 Text-figures)

A brief review of the Meliolales is given, mainly based on Indonesian material. It is concluded that the order should be retained in the Loculoascomycetes, where it is closely related to the Microthyriales. The genus *Neoballadyna* (Englerulaceae) and the species *Balladyna pavettae* are described as new, *Neoballadyna butleri* is proposed as a new combination.

In the old classifications *Meliola* and allied genera were always placed in the order Perisporiales. Subsequent investigations have shown that *Perisporium* does not belong in this order as it was often delimited. So the name had to be changed and was replaced by the designation Erysiphales. The Erysiphaceae now incorporated in this order, however, have nothing in common with the old members of the Perisporiales. So once more renaming was necessary and Martin (26) has chosen the name Meliolales. He placed in this order two families viz. Meliolaceae and Englerulaceae.

Up till now this order was considered to belong to the subclass Loculoascomycetes. Recently von Arx (2), after a study of the genus *Armatella*, a member of the Meliolaceae, came to the conclusion that we are dealing here with a true representative of the subclass Euascomycetes. The family Meliolaceae was transferred by him to the order Sphaeriales. He came to this conclusion because *Armatella* as well as *Meliola* have thin-walled, seemingly unitunicate asci, whereas in the first mentioned genus he saw what he assumed to be true paraphyses. The other genera of the order, mostly belonging to the Englerulaceae, were tentatively placed by him in the Dothiorales.

Now thin-walled asci may also be present in true Loculoascomycetes. It may even be possible that such asci are in reality bitunicate, but that with the ordinary methods employed this is not detectable. The question of the asci becomes further complicated by the discovery of Doguet (4, 5) that bitunicate asci can be found in a species belonging to the Ascohymeniales.

In regard of the paraphyses of *Armatella*, these structures are not true paraphyses, but an interascicular tissue, which is dissolved in due course.

In my opinion we can still maintain the order Meliolales with the two families mentioned in the Loculoascomycetes. In this paper I shall discuss them with special

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reference to some examples from Indonesia. Further, their relations with the Microthyriales will be elucidated.

Whereas the family Meliolaceae is neatly defined, in the family Englerulaceae a number of genera need further investigation before they can be definitely inserted.

MELIOLALES

Mycelium richly developed, either wholly superficial or partly penetrating the host. The superficial part dark coloured, with or without 1–2-celled hyphopodia, with or without setae. The hyphopodia producing haustoria within the host. Ascocarpia more or less globose, originating laterally on the hyphae, sessile or stipitate, with or without an opening at the top, with or without setae. In some cases deliquescent. Asci one to many; 2–8-spored. Spores brown, with 1–4 cross-walls. In a few instances conidia present, formed either directly on the mycelium or in pycnidia.

Leaf parasites, sometimes also on the leafstalks and young twigs.

MELIOLACEAE

Dark coloured mycelium wholly superficial, with 2-celled capitate and often also mucronate, opposite, alternate, or irregularly placed hyphopodia. From the capitate hyphopodia haustoria are produced within the epidermal cells of the host. With or without simple or branched setae. Ascocarps more or less globose, with distinct opening at the top, smooth, with setae or sometimes vermiform appendages. Asci 2–4-spored, thin-walled. Spores brown, with 4 cross-walls, only in one genus with 1 cross-wall. No conidia present.

Leaf parasites.

In this family the following genera are placed.

MELIOLA Fr.

Meliola Fr., Syst. Orb. veg. 111. 1825.

Mycelium with numerous dark, simple or branched setae. Ascocarps smooth.

IRENOPSIS Stevens

Irenopsis Stevens *in* Ann. mycol., Berl. **25**: 411. 1927.

Mycelium without, but ascocarps provided with setae.

APPENDICULELLA Höhn.

Appendiculella Höhn. *in* S.B. Akad. Wiss. Wien (Math.-nat. Kl., Abt. I) **128**: 556. 1919.

Mycelium without setae. Ascocarps with typical vermiform appendages.

ASTERIDIELLA McAlpine

Asteridiella McAlpine *in* Proc. Linn. Soc. New S. Wales **1**: 38. 1897.
Irene Theiss. & Syd. *in* Ann. mycol., Berl. **15**: 194. 1917.
Irenina Stevens *in* Ann. mycol., Berl. **25**: 411. 1927.

Mycelium and ascocarps without setae or appendages.

AMAZONIA Theiss.

Amazonia Theiss. *in* Ann. mycol., Berl. **11**: 499. 1913.
Actinodothis H. & P. Syd. *in* Philipp. J. Sci. **9**: 174. 1914.

Mycelium and ascocarps without setae, but the latter flat and shield-like as in the ascocarps of the Microthyriales.

ARMATELLA Theiss. & Syd.

Armatella Theiss. & Syd. *in* Ann. mycol., Berl. **13**: 235. 1915.

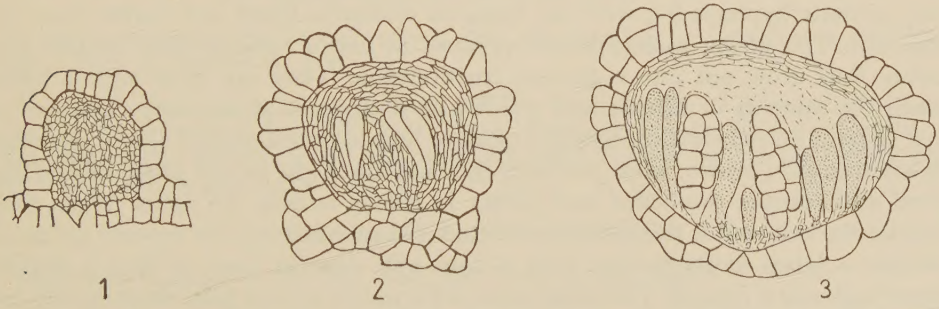
Mycelium and ascocarps without setae. Ascocarps globose, containing asci with 2-celled ascospores.

ARMATELLA LITSEAE (P. Henn.) Theiss. & Syd.

Armatella litseae (P. Henn.) Theiss. & Syd. *in* Ann. mycol., Berl. **13**: 235. 1915.

JAVA, Hortus Bogoriensis, June 1950, *Boedijn*, on *Litsea* spec. (herb. Boedijn).

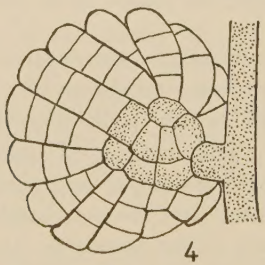
In all these genera the young ascocarp is wholly filled with a more or less pseudoparenchymatic tissue (Fig. 1). In this tissue the asci originate (Fig. 2, 3). When spore formation takes place this tissue gradually begins to disintegrate and in fully mature ascocarps it has disappeared entirely. The number of spores in the asci is two to four; sometimes two- and four-spored asci may be found in the same ascocarp. In the old literature it is sometimes stated that the asci dissolve at maturity and that the spores are set free by disintegration of the ascocarps. In point of fact, however, the spores are forcibly shot away through the ostium. This can be easily demonstrated by placing a cover-glass or slide over a colony of the fungi. After some time numerous spores may be seen adhering to the glass. Or one may place leaves with the colonies uppermost in a petri-dish. Subsequently the inside of the lid becomes covered with hundreds of spores, which in consequence must have been shot upwards in the air for a distance of about two centimeters. Spore germination soon takes place. Spores caught on glass usually germinate from the poles by a short



Figs. 1–3. *Meliola rizalensis* H. & P. Syd., ascocarps of different ages in cross section: 1—very young ascocarp; 2—formation of asci; 3—formation of ascospores.

thread ending in a hyphopodium, but when spores germinate on leaves it often happens that all cells of the spore form germ tubes.

In all forms studied, it can be observed that the young ascocarps are formed laterally on the hyphae. They are firmly pressed on the leaf surface and therefore become flat, with the cells distinctly radially arranged (Fig. 4). In this stage they show a striking resemblance to the young ascocarps of the Microthyriales (Fig. 5). During further development it is seen that in most forms a globose structure, the ascocarp proper, arises from the centre of the bottom plate. Von Höhnel (19, 20) studied these structures and pointed out that *Meliola* must be nearly related to the Microthyriaceae. This is certainly true, and the theory is much strengthened by the presence of shield-shaped ascocarps in the genus *Amazonia*. The same observations were also made by Ryan (32) who published a comparative study of the young ascocarps in the Microthyriaceae and the genus *Meliola*. They are indeed much alike, the only difference being that in the Microthyriaceae the ascocarps



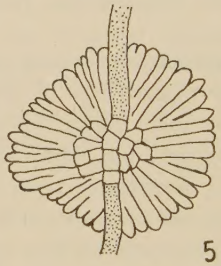


Fig. 4. *Meliola pterocarpiae* Yates, primordial ascocarp.
Fig. 5. *Asterina lawsoniae* Henn. & Nym., primordial ascocarp.

are mostly formed on the underside of a hypha (Fig. 5), whereas in *Meliola* and allied forms they start laterally on a thread.

The genus *Armatella*, which certainly belongs in the Meliolaceae, is distinguished from all other genera by the presence of two-celled ascospores. The mycelium shows only capitate hyphopodia, with the head-cell distinctly lobed and darker than the stalk-cell. The young ascocarps also produce at first a radially built bottom disc before they grow out into a globose fructification. They are filled with a tissue much the same as in *Meliola* and which also disappears at maturity. The asci at first contain four one-celled, hyaline, more or less dumbbell-shaped spores but these slowly turn pale brown. Most probably they are shot away in this phase of development and become two-celled and darker in colour outside the ascus. When fully mature the cell-wall is distinctly granulated. On germinating the top-cell produces directly a lobed hyphopodium with a cross-wall near its base, so that a slightly lobed stalk-cell is formed. The basal spore cell is nearly always paler than the top-cell and is often collapsed. By the presence of two-celled ascospores this genus connects the Meliolaceae with the Englerulaceae.

ENGLERULACEAE

Mycelium superficial with 1-celled hyphopodia which form haustoria in the host, or without hyphopodia and in that case partly penetrating the host. Mycelium with or without setae. Ascocarps globose, thin-walled, sessile or stipitate, glabrous or with setae, with or without an opening at the top, in some genera deliquescent. Asci 1 to many, 8-spored. Spores brown, 2-celled. In a few forms conidia are formed, either directly on the mycelium or in pycnidia.
Leaf parasites.

For the time being, the following genera are incorporated in this family.

ENGLERULA P. Henn.

Englerula P. Henn. *in* Bot. Jb. **34**: 49. 1905.
Hyalotheles Speg. *in* Rev. Mus. La Plata **15**: 12. 1908.
Anatexis H. Syd. *in* Ann. mycol., Berl. **26**: 90. 1928.

Superficial dark coloured mycelium without hyphopodia, but penetrating the host through the stomata. Ascocarps globose, astomous, at first parenchymatic, afterwards glebose, diffluent, containing a small number of asci. Asci 8-spored. Spores conglobate, brown, 2-celled, constricted at the cross-wall. Conidia subglobose to elongated, dark coloured, 1-celled, in pycnidia of the *Capnodiastrum* type.

ENGLERULA MACARANGAE P. Henn.

Englerula macarangae P. Henn. *in* Bot. Jb. **34**: 49. 1905.

This species occurs also in Indonesia, but our material consists chiefly of the conidial form.

CAPNODIASTRUM Speg.

Capnodiastrum Speg. *in* An. Soc. cient. argent. **1**: 145. 1883.

Pycnidia superficial, subglobose, dark, astomous, mucose-diffluent. Conidiophores on the inside of the pycnidial wall, very short. Conidia large, 1-celled, subglobose to elongated, very dark blackish brown, nearly opaque.

CAPNODIASTRUM MACARANGAE (Petr.) Petr.

Oothecium macarangae Petr. *in* Ann. mycol., Berl. **26**: 390. 1928. — *Capnodiastrum macarangae* (Petr.) Petr. *in* Sydowia **6**: 342. 1952.

SUMATRA, Deleng Singkut near Brastagi, May 1927, *Boedijn*, on leaves of *Macaranga* spec.; JAVA, Gunung Perbakti, Sept. 1922, *Bakhuizen van den Brink*, on leaves of *Macaranga* spec.; Puntjak pass, Aug. and Oct. 1941, *Boedijn*, on leaves of *Macaranga rhizinoides* (all in herb. Boedijn).

ENGLERULELLA Hansford

Englerulella Hansford *in* Arq. Inst. Biol. São Paulo **12**: 238. 1941.

Superficial mycelium with hyphopodia, without setae. Ascocarps subglobose, mucose diffluent. Asci few, 8-spored. Spores brown, 2-celled. Conidia in pycnidia of the *Capnodiastrum* type.

BALLADYNA Rac.

Balladyna Rac., Par. Alg. u. Pilze Java's **2**: 3. 1900.

Superficial mycelium with 1-celled hyphopodia and numerous unbranched setae. Ascocarps subglobose, stipitate, smooth, not diffluent, opening at the top and containing 1–3, mostly 1–2 asci. Asci 8-spored. Spores conglobate, brown, 2-celled, constricted at the septum. No conidial fructification known.

BALLADYNA VELUTINA (Berk. & Curt.) Höhn.

Asterina velutina Berk. & Curt. *in* Proc. Amer. Acad. Arts Sci. 129. 1862. — *Balladyna velutina* (Berk. & Curt.) Höhn. *in* S.B. Akad. Wiss. Wien (Math.-nat. Kl., Abt. I) **119**: 411. 1910.
Balladyna gardeniae Rac., Par. Alg. u. Pilze Java's **2**: 6. 1900.
Dimerosporium gardeniicola P. Henn. *in* Bot. Jb. **31**: 739. 1902.

Colonies black, amphigenous, roundish, 0.5–8 mm, mostly 1–3 mm, in diam. but when crowded confluent and then covering nearly the whole leaf surface. Mycelium radiating, dark, branched, septate and anastomosing; the separate threads 3–5 μ broad. Hyphopodia alternating, 1-celled, lobed, 8–10 × 5–8 μ. Setae on the mycelium numerous, dark brown, septate, acuminate obtuse, 70–120 μ long, 5–7 μ broad at the base, 2.5–3 μ near the top. Ascocarps brown, subglobose to egg-shaped, stipitate, 42–55 μ high, 36–48 μ broad, opening at the apex. Wall consisting of angular parenchymatic cells 4–7 μ long. Stalk 1-celled, bent, 8–20 × 5–8 μ, mostly broadened near the base of the ascocarp. Asci 1–2, subglobose to oval, with thickened top; 8-spored, 36–42 × 25–29 μ; wall 2–3 μ broad at the top. Spores conglobate, oblong, brown, 2-celled, constricted at the cross-wall and rounded at the poles, 17–22 × 8–10 μ.

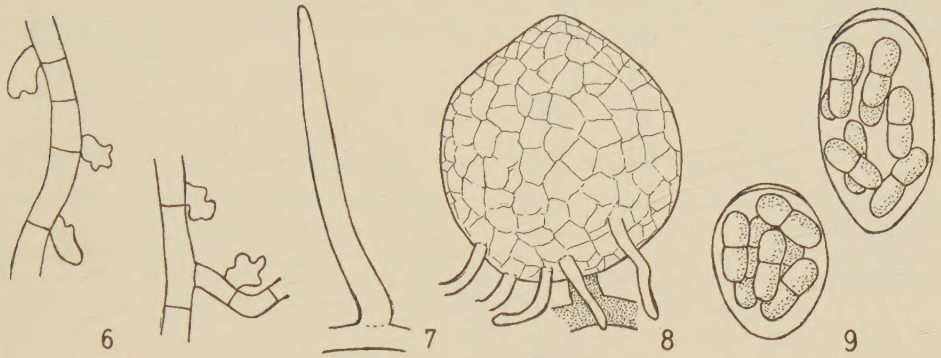
JAVA, Bogor, *Raciborski 88*, on leaves of *Gardenia lucida*; Hortus Bogoriensis, Nov. 1949, April, May, July, Oct. 1950, April 1952, June 1953, May, July 1954, January 1955, *Boedijn*, on leaves of *Gardenia augusta*, *G. latifolia*, and *G.* spec. (all in herb. Boedijn).

Balladyna pavettae Boedijn, *nov. spec.*

Plagulae amphigenae, plerumque epiphyllae, usque ad 1–4 mm diam. vel confluentes. Mycelium ex hyphis brunneis 5–6 μ crassis, ramosis, septatis compositum. Hyphopodia alterna, lobata, continua, 7–11 × 5–7 μ. Setae myceliales numerosae, erectae, simplices, 70–100 × 7–8 μ. Ascocarpia subglobosa, brunnea, stipitata, 49–65 × 46–62 μ, setis simplicibus 7–40 × 3–4 μ ornata. Asci 1–2, 8-spori, 33–47 × 19–25 μ. Sporae conglobatae, oblongae, 1-septatae, constrictae, leves, 16–24 × 6–7 μ.

Typus: Java, Hortus Bogoriensis, Nov. 1949, *Boedijn*, in foliis *Pavettae* sp. (herb. Boedijn).

Colonies on both sides of the leaves, but mostly epiphyllous, 1–4 mm in diameter, sometimes confluent, in old colonies centre often flaking away. Mycelium radiating, branched, septate and anastomosing, dark brown, the separate threads 5–6 μ broad. Hyphopodia 1-celled, alternating, weakly lobed, 7–11 × 5–7 μ. Setae on mycelium numerous, simple, dark brown, septate, gradually attenuated near the apex, 70–100 μ long, 7–8 μ broad near the base, 2–3 μ at the top. Ascocarps subglobose, stipitate, opening at the top, 49–65 μ high, 46–62 μ broad, provided near the base with a varying number of brown, downwards bent, unbranched hairs. These hairs mostly non-septate, often wavy, 7–40 × 3–4 μ. Wall of ascocarp consisting of angular parenchymatic cells 5–9 μ long. Stalk very short, 6–11 × 5–7 μ. Asci 1–2.



Figs. 6–9. *Balladyna pavettae* Boedijn: 6—mycelium with hyphopodia; 7—hair; 8—ascocarp; 9—asci.

8-spored, oval to more or less elongated, 33–47 × 19–25 μ. Wall at top 2–4 μ broad. Spores conglobate, oblong, brown, 2-celled, weakly constricted at the septum, with rounded poles. Basal spore-cell usually somewhat narrower than the top-cell; 16–24 × 6–7 μ.

JAVA, Hortus Bogoriensis, Nov. 1949, *Boedijn*, on leaves of *Pavetta* sp. (type); Aug. 1953, *Boedijn*, on leaves of *Pavetta gardeniaefolia* (herb. Boedijn).

The chief characters by which this new species is distinguished from the previous one are the different host plant, the presence of hairs on the ascocarp, and the slightly narrower spores.

Neoballadyna Boedijn, *nov. gen.*

Mycelium ex hyphis atrobrunneis, flexuosis vel tortuosis, exhyphopodiatis, septatis, ramosis compositum. Haustoria in cellulas epidermidis penetrantia. Setae myceliales, simplices, numerosae, erectae, brunneae. Ascocarpia stipitata, globosa vel ovata, glabra, parenchymatica, ostiolata. Asci 1–2, 8-spori. Sporae conglobatae, brunneae, oblongae, 1-septatae, constrictae episporio tenuiter granuloso.

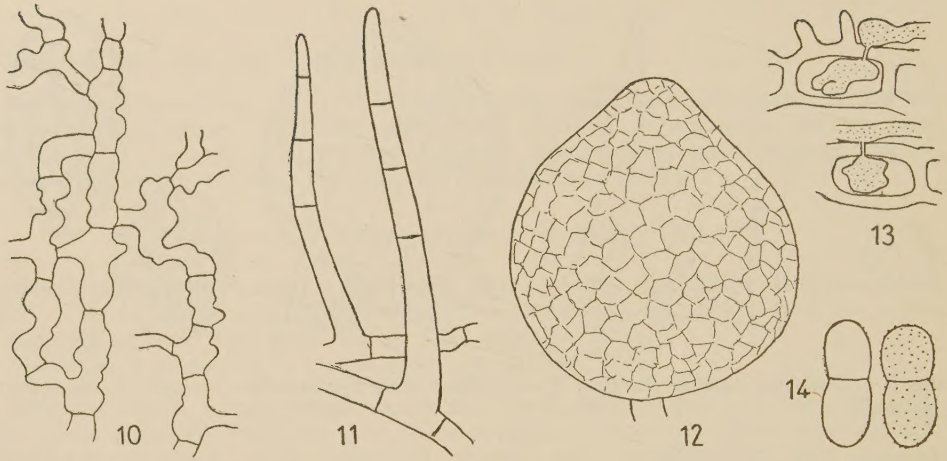
Typus generis: *Balladyna butleri* H. & P. Syd.

Mycelium brown, septate, branched and anastomosing, the threads typically tortuous and crooked with many constrictions. No hyphopodia present, but mycelium penetrating the epidermis of the host by small haustoria. Setae numerous, unbranched, dark brown. Ascocarps globose, shortly stalked, glabrous, pale brown, opening at the top and containing 1–2, mostly 2 asci. Asci oval, 8-spored, thickened at the apex. Spores conglobate, oblong, 2-celled, constricted at the cross-wall, with rounded poles, pale brown, when fully mature cell-wall delicately granulated.

Neoballadyna butleri (H. & P. Syd.) Boedijn, *nov. comb.*

Balladyna butleri H. & P. Syd. *in* Ann. mycol., Berl. **9**: 388. 1911 (basionym).

Colonies on both sides of the leaves, black, typically elongated, 1–5 mm long, by confluence often much longer. Mycelial threads running especially in the direction of the long axis of the leaf, brown, septate, branched, anastomosing,



Figs. 10–14. *Neoballadyna butleri* (H. & P. Syd.) Boedijn: 10—mycelium; 11—hairs; 12—ascocarp; 13—haustoria; 14—spores.

tortuous and crooked with many constrictions, 4–8 μ broad. No hyphopodia present, but mycelium penetrating the epidermis of the host by weakly lobed, pale brown haustoria, 6–10 μ in diam. Setae abundant, unbranched, septate, brown, 56–126 μ long, 5–6 μ broad at the base, 3–4 μ at the top. Ascocarps shortly stalked, subglobose, pale brown, 48–68 μ high, 52–61 μ broad, opening at the top. Wall consisting of angular parenchymatic cells 5–9 μ long. Stalk 1-celled, 8–16 × 5–7 μ. Mostly 2 asci present. Asci 8-spored, oval, thickened at the apex, 26–39 × 21–26 μ. Spores conglobate, oblong, pale brown, 2-celled, constricted at the septum and rounded at the poles; 23–29 × 10–12 μ. Fully ripe spores, outside the ascus, showing a delicately granulated cell-wall.

JAVA, Tjilodong, May 1922, *Van Overeem*; Nov. 1931, *Boedijn*, both on leaves of *Gigantochloa apus*; Hortus Bogoriensies, July, Aug. 1953, *Boedijn*, on leaves of *Bambusa* spec. (all in herb. Boedijn).

Sydow, who considered this species to belong to the genus *Balladyna*, remarks, however, that hyphopodia are scarce. Most probably he mistook young ascocarpia for hyphopodia, as the last named structures are wholly lacking in this species.

BALLADYNOPSIS Theiss. & Syd.

Balladynopsis Theiss. & Syd. *in* Ann. mycol., Berl. **15**: 475. 1917.
Wageria Stevens & Dalbey *in* Mycologia **11**: 7. 1919.
Balladynastrum Hansford *in* Proc. Linn. Soc., Lond. **153**: 15. 1941.

Mycelium with hyphopodia, but without setae. Ascocarps stalked, glabrous or with hairs. Asci 1 to a few, 8-spored. Spores brown, 2-celled.

BALLADYNELLA Theiss. & Syd.

Balladynella Theiss. & Syd. *in* Ann. mycol., Berl. **15**: 478. 1917.

Mycelium without hyphopodia and setae, penetrating the host through the stomata. Ascocarps glabrous, containing a single ascus. Ascus 8-spored. Spores brown, 2-celled.

ALINA Rac.

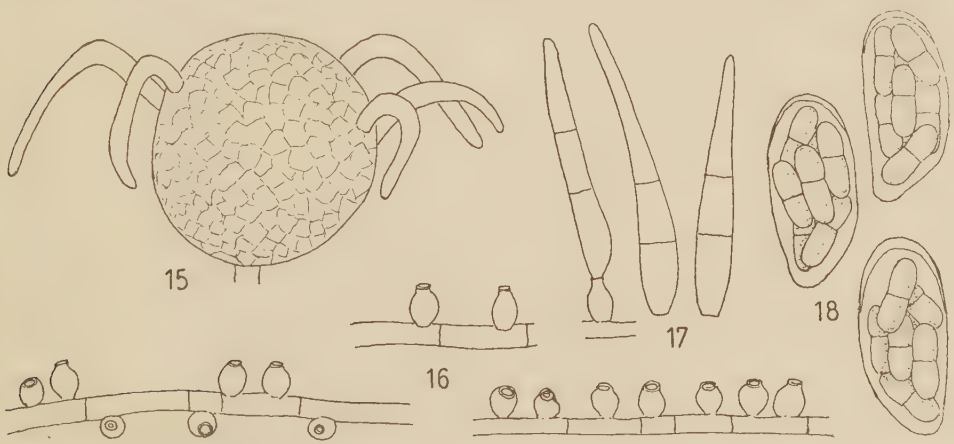
Alina Rac. *in* Bull. intern. Acad. Sci. Cracovie No. 3: 374. 1909.

Mycelium dark coloured, radiating, sparingly branched, without hyphopodia and setae, but penetrating the host with colourless hyphae. Ascocarps globose, shortly stalked, provided with a small number of bent hairs, astomous, containing several asci. Asci 8-spored. Spores coloured, 2-celled. Conidia brown, obclavate, mostly with 2 cross-walls, on short phialides directly on the mycelium.

ALINA JASMINI Rac.

Alina jasmini Rac. *in* Bull. intern. Acad. Sci. Cracovie No. 3: 375. 1909.

Colonies on both sides of the leaf, round, black, 1–3 mm in diam., by confluence often larger. Mycelium in centre of colony very dense, forming a mat from which the hyphae radiate and colourless threads penetrate the epidermis and mesophyll. Superficial threads dull brown, 3–5 μ broad, septate, rather sparingly branched, sometimes adhering in bands. Directly on the hyphae are found ellipsoid, brown phialides 7–12 μ long, 5–6 μ broad in the middle, 2–3 μ at the top, and bent upwards and alternating or arranged in rows. On these phialides originate the more or less obclavate, brown conidia with 2–4, mostly 2, cross-walls, 49–63 μ long, 6–14 μ broad near the base and 2.5–4 μ near the top. Ascocarps in the centre of the colony shortly stalked, globose to subglobose, astomous, dark brown, about 40 μ in diam. or 36–60 × 33–55 μ, provided near the apex with a small number of bent, brown, non-septate hairs, 16–53 × 3–5 μ, attenuated near the top to 2–2.5 μ. Wall of ascocarp consisting of brown, parenchymatous cells 4–6 μ long. Stalk very short, 2.5–5 × 5–7 μ. Several asci present. Asci broadly ellipsoid, 8-spored, 28–37 ×



Figs. 15–18. *Alina jasmini* Rac.: 15—ascocarp; 16—hyphae with phialides; 17—conidia; 18—asci.

12–15 μ, apex 1.5–2.5 μ broad. Spores conglobate, oblong, olivaceous, 2-celled, faintly constricted at the septum, with rounded poles, the lower cell a trifle longer than the top-cell; 12–15 × 5–6 μ.

JAVA, Depok, Oct. 1932, *Boedijn*, on leaves of *Captosapelta tomentosa* (herb. Boedijn).

Some colonies show only conidia, others only ascocarps, whereas many have both types of fructification.

Our material fully agrees with the description as given by Raciborski and hence can be considered conspecific. However, the host plant is entirely different as Raciborski stated that he collected his material on the leaves of a species of *Jasminum*. It always remains possible that the mention of *Jasminum* is due to an error.

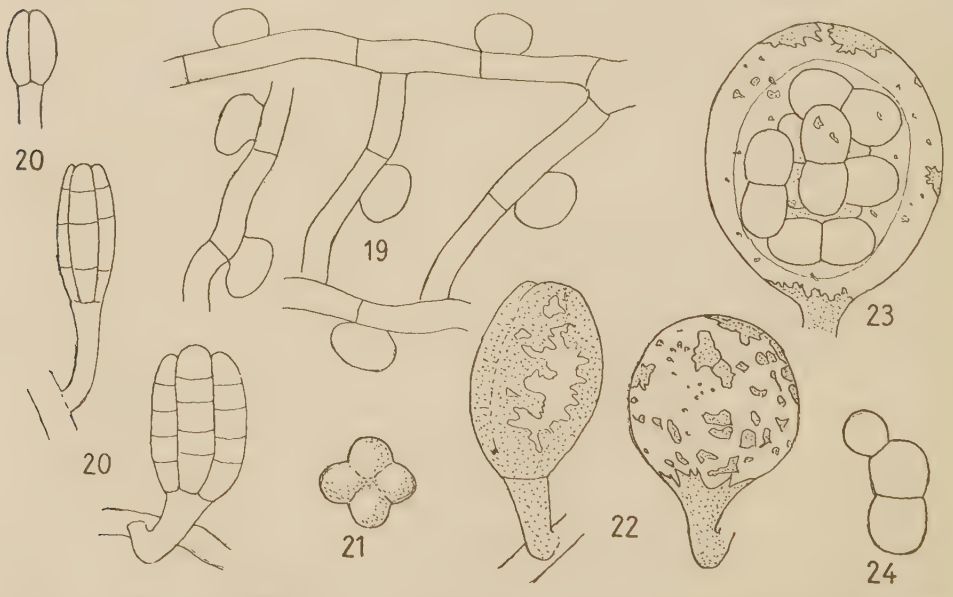
THRAUSTE Theiss.

Thrauste Theiss. *in* Verh. zool.-bot. Ges. Wien **66**: 337. 1916.

Mycelium with 1-celled hyphopodia, but without setae. Ascocarps stipitate, mucose diffluent, containing a single ascus. Ascus 8-spored. Spores 2-celled, pale coloured.

THRAUSTE MEDINILLAE (Rac.) Theiss.

Balladyna medinillae Rac. *in* Bull. intern. Acad. Sci. Cracovie No. 3: 373. 1909. — *Englerula medinillae* (Rac.) Höhn. *in* S.B. Akad. Wiss. Wien (Math.-nat. Kl., Abt. I) **188**: 1469. 1909. — *Thrauste medinillae* (Rac.) Theiss. *in* Verh. zool.-bot. Ges. Wien **66**: 337. 1916.



Figs. 19–24. *Thrauste medinillae* (Rac.) Theiss.: 19—mycelium with hyphopodia; 20—young ascocarps; 21—young ascocarp in cross section; 22—ascocarps in two stages of swelling; 23—mature ascocarp with ascus; 24—germinating ascospore.

Colonies black, on both sides of the leaves, 1–5 mm in diam., often much larger by confluence. Mycelium dark brown, branched, septate, more or less undulating and forming a network by anastomosing, the separate threads 4–8 μ broad, provided with 1-celled, globose hyphopodia either in a single row, alternating or irregularly placed, 9–14 μ broad, 8–10 μ high. Ascocarps at first a raised club-shaped cell; later a cross-wall cuts off the stalk from the head-cell and the head is then divided by longitudinal walls into 4 cells which in turn are divided by cross-walls into 4 parallel rows of 3 to 5 nearly isodiametric cells about 6 μ long. In this stage the ascocarp is 25–34 × 16–21 μ. Stalk 16–32 μ long, 4–7 μ broad in the middle, 6–10 μ near the top. Gelatinization and swelling of the cells in the head of the ascocarp transforms this into a subglobose or oval body 43–60 × 37–52 μ with remnants of the outer cell-walls as scattered dark irregular scales on the surface of the subhyaline jelly. In the centre of the ascocarp a single, subglobose, 8-spored ascus is formed, 41–45 × 33–36 μ. Ascospores conglobate, oblong, 2-celled, constricted at the cross-wall, with strongly rounded poles, long remaining hyaline, but at length becoming pale brown, 24–29 × 12–16 μ.

JAVA, Tjibodas, April 1932, *Boedijn* on leaves of *Medinilla speciosa*; Tjibeureum, July 1941, *Boedijn*, on *Medinilla* spec.; Puntjak pass, Sept., Oct. 1941, *Boedijn*, on *Medinilla intermedia*; Gunung Bunder, April 1931, *Boedijn*, on *Melastoma polyanthum* (all in herb. Boedijn).

Melastoma polyanthum is a new host for the present species. As this material agrees in every respect with the collections on *Medinilla* I consider it conspecific.

In the Englerulaceae the young ascocarps are also formed laterally on the hyphae, but they grow upwards instead of downwards as in the Meliolaceae. So they, of course, do not show the radially built basal plate. In this family a rather large number of genera are incorporated, but I have mentioned only a few, as many have to be re-examined before they can be placed satisfactorily. Other genera do not belong here, as for instance *Schiffnerula* Höhn., in which I found that the ascocarp starts as a radially built plate, as in the Microthyriales. Moreover it forms phragmosporous conidia, which are also found in the nearly related genus *Clypeolella* Höhn., a true member of the Microthyriales.

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FOUR NEW FAMILIES OF HYMENOMYCETES

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Four new families are proposed, viz. Bankeraceae, excluded from the Thelephoraceae trib. Hydnelleae; Echinodontiaceae; Gomphaceae, for the Clavariaceae trib. Ramarieae in an emended circumscription; and Clavulinaceae, a former tribe raised in rank.

Bankeraceae Donk, *fam. nov.*

Receptaculum stipitatum, pileatum, (certe in sicco) odorem *Trigonellae* vel *Meliloti* forte praebens. Hymenophorum aculeatum; aculei albescentes vel cinerascentes nunquam ob sporas brunnescentes. Basidia clavata, haud septata, apice sporis 2–4. Sporae globosae, minutae (3–5 μ diam.), breve echinulatae, accumulatae colore albido, haud amyloideae. Terrestres. — Typus: *Bankera* Coker & Beers ex Pouz.

The two genera which make up the contents of this family are *Phellodon* P. Karst. and *Bankera* Coker & Beers ex Pouz. I assigned them previously to the Thelephoraceae (Phylacteriaceae) tribus Hydnelleae Donk and their removal now leaves in the tribus, *Sarcodon* Quél. ex P. Karst., *Hydnellum* P. Karst. (synonym, *Calodon* Quél. ex P. Karst.) and *Hydnodon* Banker. These remaining genera are quite typical of the Thelephoraceae as to their spores and several other features, which cannot be said of *Bankera* and *Phellodon*. In founding the new family the difficult definition of the Thelephoraceae is considerably facilitated. The two genera were placed in the Hydnelleae mainly because of a high degree of superficial resemblance, more in particular of *Bankera* to *Sarcodon*, and of *Phellodon* to *Hydnellum*. However, their spores show none of the features typical of the spores of the Thelephoraceae; they are neither more or less sinuose in outline nor coarsely tuberculate or spiny, and in addition are not brown coloured.

It is a pleasure by the choice of the type genus to commemorate in the family name that outstanding student of the hydnaceous fungi, H. J. Banker.

Echinodontiaceae Donk, *fam. nov.*

Receptaculum sessile et dimidiatum vel conchatum, vel effuso-reflexum. Contextus lignosus, coloratus; hyphae fibulatae. Hymenophorum subirregulare dentatum, aculeis lignosis. Hymenium crassescens. Cystidia ventricoso-subulata, colorata et setas aemulantia, vel hyalina. Basidia clavata, haud septata, apice sporis 4. Sporae ovoideae vel ellipsoideae; paries levis, amyloideus. Lignicolae. — Typus: *Echinodontium* Ell. & Ev.

The Echinodontiaceae consists of a single genus comprising only a few species of which one is well known in the North American continent as the Indian-paint fungus. It has been assigned to both the artificial families Hydnaceae and Polyporaceae, but its hymenophore conforms to neither, the latter being intermediate

in its configuration. Patouillard (*1900:* 117) was the first to stress its isolated position by erecting a "Série des Echinodonties" for it among his "Hydnés". "Cette série", he remarked, "est dans les Hydnés la correspondante exacte des Ignaires dans les Porés." His 'Ignaires' are the polyporoid Hymenochaetaceae.

Superficially *Echinodontium tinctorum* (Ell. & Ev.) Ell. & Ev. does indeed resemble a woody species of the Hymenochaetaceae, and the presence of setae-like cystidia would confirm this. However, the cystidia are really chemically quite different from setae and the hyphae bear clamps, and I am now convinced that there is no relationship with the Hymenochaetaceae. Its remarkable microscopic features, inclusive of the amyloid spores, form an obstacle to its inclusion in the Polyporaceae; and with the Hydnaceae (*sensu stricto*, ultimate type, *Hydnum repandum* L. per Fr.) it has also no connections.

Gomphaceae Donk, *fam. nov.*

Ramarieae Donk, Rev. niederl. Homob.-Aphyll. **2**: 103. 1933.

Nevrophyllaceae Heinemann *in* Bull. Jard. bot. Bruxelles **28**: 434. 1958 (nomen illegitimum). — Holotype: *Nevrophyllum* Pat. apud Doass. & Pat. (1887); not *Neurophyllum* Torr. & Gray (1840; Umbelliferae); not *Neurophyllum* Presl (1843; Hymenophyllaceae).

Receptaculum resupinatum (hymenophoro levi vel dentato) vel erectum (coralloideum hymenophoro levi usque ruguloso, vel cantharelloideum hymenophoro ramoso- et radiato-plicato). Contextus monomiticus; hyphae fibulatae. Cystidia inconspicua vel absentia. Basidia graciliter clavata, haud septata, sporis 2–4. Sporae plus minus ellipsoideae usque oblongae (recte vel subsigmoideae), mediocres vel sat magnae, adaxillariter distincte applanatae, plus minus distincte coloratae et varie ornatae; paries forte "Cotton Blue" absorbens. Humicolae vel in ligno putrescenti inveniuntur. — Typus: *Gomphus* Pers. per S. F. Gray.

When studying the corticioid fungus *Ramaricium occultum* John Erikss., its author (Eriksson, *1954*) concluded that a close relationship existed between *Ramaricium* John Erikss., *Kavinia* Pilát, and *Ramaria* (Fr.) Bonord. emend. Donk. He found several items of agreement, more in particular in connection with the spores; he also found that the spore wall in all three strongly absorbs Cotton Blue. These three genera have been placed in various families by modern mycologists: Corticiaceae (*Ramaricium*), Hydnaceae (*Kavinia*), Clavariaceae (*Ramaria*). This series is to be extended with a genus that has been placed in the Agaricaceae and the Cantharellaceae.

Maire (*1914:* 216) took the first step in the recognition of this series when he remarked that the spores of two species of *Nevrophyllum* Pat. had "la plus grande ressemblance avec les spores des Clavaires du groupe *Clavariella* (*C. aurea*, *formosa*, *flava*, par example). Si l'on ajoute a cette similitude celle de la teinte des spores en masse, celle des basides, on ne peut qu'en conclure à une affinité extrême des *Nevrophyllum* et des *Clavariella*." Donk (l.c.) went a step further: he redefined the clavariaceous genus under the name *Ramaria* (Fr.) Bonord. and placed it with *Gomphus* Pers. per S. F. Gray (the correct name for *Nevrophyllum*) in a special tribus, Ramariae, characterized by the spores. Now that Eriksson has demonstrated that

the spore type of *Ramaria* also occurs in some of the resupinate genera (*Kavinia*, *Ramaricium*), it is proposed to enlarge the tribus and raise it to the rank of a family. Since the name *Ramaria* (Fr.) Bonord. is illegitimate in view of *Ramaria* S. F. Gray (a proposal has been moved for its conservation), that generic name is avoided in making the family name and the name Gomphaceae chosen, although some confusion might be expected in the future with the family name Gomphidiaceae given to a small group of agarics.

Recently Heinemann introduced the family Nevrophyllaceae for *Nevrophyllum* Pat. as well as *Clavariadelphus* Donk "et, probablement, *Polyozellus* Murr." I do not think the three are closely related and I would leave *Clavariadelphus* in the still artificial family Clavariaceae. Furthermore I agree with Imazeki (*1953*) that *Polyozellus* Murrill should be referred to the Thelephoraceae. Heinemann's family name could not be adapted since it is derived from an illegitimate generic name, *Nevrophyllum* Pat. being preoccupied.

Clavulinaceae Donk, *stat. & fam. nov.*

Basionym: Clavulineae Donk, Rev. niederl. Homob.-Aphyll. **2**: 16. 1933. — Monotype: *Clavulina* J. Schroet.

The only genus of this family is usually included in the Clavariaceae. Donk (*1933:* 16) made it a special tribus in his emendation of the Cantharellaceae mainly on the basis of cytological information concerning the basidia published by Maire, Juel, and Bauch, but I now believe it to be sufficiently distinct for separate treatment as a family. For a recent study of the hymenium and its components see Corner (*1950:* 59).

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A HYDNUM FROM KASHMIR

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(With ten Text-figures)

Mycoleptodonoides Nikol. is compared with other genera, *Hydnum aitchisonii* Berk. is redescribed, and for it the new combination *Mycoleptodonoides aitchisonii* (Berk.) Maas G. is proposed.

Among the type specimens of *Hydnum* borrowed from the Kew Herbarium, a report on the greater part of which was included in an earlier paper (Maas Geesteranus, 1960), was that of *Hydnum aitchisonii*. This was found to possess several characters that agreed with those of *Mycoleptodonoides vassiljevae* which had been described by Nikolajeva as the type species of a new genus. The striking resemblance led to the conclusion that *Hydnum aitchisonii*, if not conspecific, belonged to the same genus Since Nikolajeva's generic description contains but little information and, what is more, since her genus comprises two wholly unrelated species, *Mycoleptodonoides* is here redescribed.

Mycoleptodonoides Nikol.

Mycoleptodonoides Nikol. *in* Bot. Mater. (Not. syst. Sect. cryptog. Inst. bot. Acad. Sci. U.S.S.R.) **8**: 117. 1952. — Type species *Mycoleptodonoides vassiljevae* Nikol., l.c. 117.

Carpophore arboricolous (?), consisting of pileus and stipe, fleshy. Pileus complicated, consisting of imbricated fan-shaped lobes, azonate, glabrous. Stipe (probably) more or less eccentric, glabrous. Hymenium covering spines on underside of pileus. Spines discrete, subulate. Context monomitic, homogeneous, not zonate. Basidia tetrasporous. Spores ellipsoid, tapering towards the base, somewhat curved, smooth, colourless, with oblique apiculus, non-amyloid. Cystidia and gloeocystidia lacking.

In the original description of *Hydnum aitchisonii* the habitat was not stated, but particles of micaceous dust on what is left of the stipe, and pieces of bark attached to other fragments of the type material suggest that the fungus was collected from a log lying on the ground.

There are several other stipitate and/or fleshy hydnaceous genera known to occur on wood, branches or trees and these are compared with the present genus in the following text.

Beenakia Reid *in* Kew Bull. 1955: 635. 1956. — This genus differs from *Mycoleptodonoides* in its spores which are brown and minutely asperate.

Boninohydnum S. Ito & Imai *in* Trans. Sapporo nat. Hist. Soc. **16**: 127. 1940. — In this genus, too, the spores are brown. Moreover, the pileus is stated to be sessile.

Climacodon P. Karst. *in* Rev. mycol. **3**/No. 9: 20. Jan. 1, 1881 & *in* Medd. Soc. F. Fl. fenn. **6**: 15. 1881. — A characteristic feature which both *Climacodon* and *Mycoleptodonoides* have in common is the flabelliform imbricate pileus, but in the former it is sessile, with the surface roughened for the greater part, and floccose-pubescent towards the margin. Further differences which separate *Climacodon* from *Mycoleptodonoides* are in the context, which is zonate, and in the presence of thick-walled cystidia in the hymenium.

Creolophus P. Karst. *in* Medd. Soc. F. Fl. fenn. **5**: 41. 1879. — This genus is typified by *Hydnum corrugatum* Fr. ex Fr., a species of which, unfortunately, little is known beyond the descriptions of its author (Fries, Obs. mycol. **2**: 269. 1818; Syst. mycol. **1**: 414. 1821; Epicr. Syst. mycol. 512. 1838; Sverig. ätl. gift. Svamp. 14. 1861). These descriptions agree in that the imbricate 'caps' are stated to have a tomentose surface, ranging from subtomentose (1818) to villose (1838). Also, the fruit-body is said to be tuberculose (1818 and 1821; which is capable of two ways of interpretation), or tuberculiform (1838; which is unmistakable), and to be deficient in its development of a stipe and a distinct pileus (1861: "Sakna fot och tydlig hatt"). Characterized in this way, *Creolophus* is clearly distinct from *Mycoleptodonoides*.

Donkia Pilát *in* Bull. Soc. mycol. France **52**: 328. 1936. — The sessile habit, strigose surface of the pileus, and the dimitic context (a character which is rarely found in Hydnums, and to which I intend to revert at some later date) are all features which readily separate *Donkia* from *Mycoleptodonoides*.

Since the presence of pieces of bark mentioned above may be accidental, the possibility that *Mycoleptodonoides* may be a terrestrial genus should not be overlooked, It is therefore necessary to consider the following genera of stipitate Hydnums with fleshy context and colourless spores.

Bankera Coker & Beers *ex* Pouz. *in* Česká Mykol. **9**: 95. 1955. — This genus is quite distinct from *Mycoleptodonoides* on account of the tomentose surface of the pileus, the subglobose and finely tuberculate spores, the odour of fenugreek when dried, and the lack of clamp connections.

Hydnum L. *ex* Fr., Syst. mycol. **1**: lvi, 397. 1821. — The characters which distinguish this genus from *Mycoleptodonoides* are the tomentose surface of the pileus, the frequent occurrence of more than four sterigmata per basidium, and the subglobose to obovoid spores.

While it is easy to show that *Mycoleptodonoides* differs from the genera enumerated above (and it differs still more from all other hydnaceous genera not mentioned here), it is quite a problem to indicate its systematic position. On account of the fleshy

substance of its context, and the smooth, colourless spores I am inclined to place *Mycoleptodonoides* in the neighbourhood of *Hydnum*. I have been unable, however, to confirm whether, as in that genus, its basidia are stichic, or whether the hymenium is a thickening hymenium.

Mycoleptodonoides aitchisonii (Berk.) Maas G., *comb. n.*

Hydnum aitchisonii Berk. *in* Grevillea **4**: 137. 1876 ("*Aitchesoni*") (basionym).

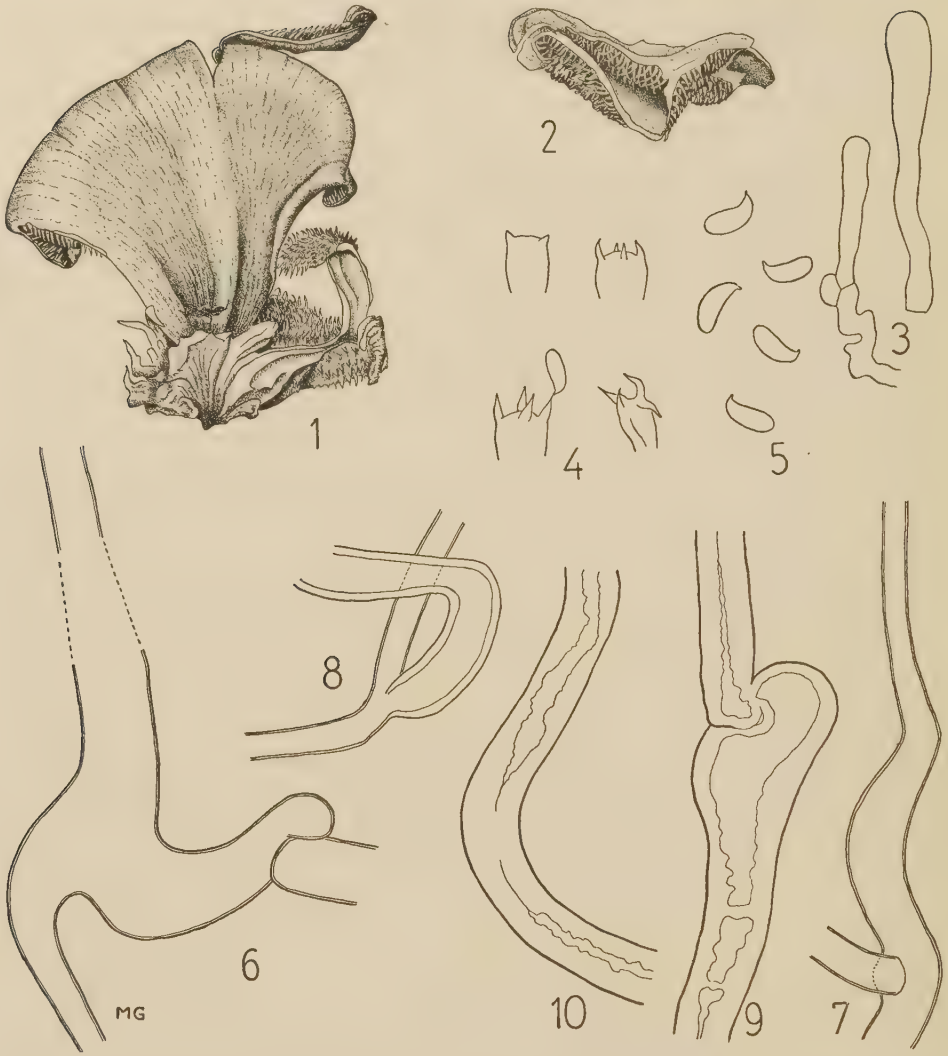
Redescription of the type, "*Hydnum Aitchisoni* Berk." (K). — Carpophore consisting of pileus and stipe, fleshy. Pileus badly broken, but obviously complicated, consisting of imbricated fan-shaped pileoli, 40–50 mm long from base to margin, 4 mm thick at the junction of pileus and stipe, thinning to 0.3 mm near the involute margin. The surface is azonate, glabrous, finely innate-fibrillose and radiately rugulose, fissured near the margin, faintly shining, ochraceous yellow-brown (between Yellow Ocher and Buckthorn Brown of Ridgway), here and there streaked with deeper colours and becoming reddish brown towards the margin (Ochraceous-Tawny or nearly Cinnamon-Brown). Stipe (probably) more or less eccentric, about 18 mm broad at the top, torn off from its base, glabrous, concolorous with pileus. Spines decurrent, crowded, subulate, up to 7 mm long, some of them pale yellowish, the majority much darkened, reddish brown, and horny and shrivelled. Context friable in pileus, firmer in stipe, homogeneous throughout, azonate, pale yellow-brown, not staining in a solution of KOH, non-amyloid. Odour and taste none.

Hymenium made up of basidia, without cystidia or gloeocystidia. Basidia cylindrical-clavate, with clamp connection at the base when immature, 4-spored, 20–24 × 4.5–6 μ, with the sterigmata up to 3 μ long. Spores ellipsoid, tapering towards the base, more or less curved, smooth, colourless, with oblique apiculus, non-amyloid, 5.4–6.3 × 1.9–2.5 μ. Hyphae of the context with clamp connections, sparingly branched, more or less flexuous but side-branches often straight for some distance, gradually or abruptly inflated in places, thin-walled but giving rise to thick-walled side-branches, the latter becoming increasingly frequent going from margin to base of pileus, with increasing thickening of the cell-walls; hyphae in the stipe almost exclusively thick-walled or with their lumen entirely obliterated.

The "e" in the epithet "*aitchesoni*" as published by Berkeley must be considered a printer's error. The name of the person who sent the fungus reads Aitchison, and Berkeley himself wrote "*Hydnum Aitchisoni*" on the label of the material.

Some points in the original diagnosis need comment since they differ from the description given above. Berkeley stated that the pileus was tomentose (in the description repeated as follows: "at first minutely tomentose . . ."), and that the spines were fuscescent. Actually, there is no trace of a tomentum, although it is true that a semblance of it is brought about by the erect ends of ruptured superficial fibers. Seen under the microscope, the hyphae appear gelatinized and firmly agglutinated even close to the margin of the pileus, which is certainly not the case where there is a true tomentose surface. With regard to the spines, these have not darkened because of the ripening of the spores, but as a result of the way they were dried.

In view of the fact that the species is said to be edible, it is remarkable that



Figs. 1–10. *Mycoleptodonoides aitchisonii* (Berk.) Maas G.: 1—pileus shown from above, with torn remnants of other pilei; 2—two imbricate pilei in radial section; 3—two immature basidia, one shown with basal clamp connection; 4—four basidia in various stages of development, the last one with its sterigmata collapsed; 5—spores; 6—hypha of the context, showing (i) the gradual inflation to twice its width, (ii) a much narrower side-branch, and (iii) a clamp connection; 7—a straight and narrow hypha, widening abruptly and becoming flexuous; 8—thin-walled hypha giving rise to a thick-walled side-branch; 9—thick-walled hypha with clamp connection; 10—thick-walled hypha with part of its lumen obliterated (Figs. 1–2: × 1; Figs. 3–10: × 1300).

nothing is known about its distribution, for no information is to be found in either Ahmad, Fungi of West Pakistan (1956) or Butler & Bisby, The Fungi of India (1931). Further, Mr. D. A. Reid informed me that there are no additional collections of the species at Kew.

By an unfortunate coincidence, Nikolajeva's work was only consulted after the first proof of the present paper had come off the press. Although the most urgent alterations, including the change of the generic name, could be inserted, the time appeared too short for a request for an examination of the type material of Nikolajeva's species to be answered.

As far as can be judged from the description, *Mycoleptodonoides vassiljevae* has much in common with *M. aitchisonii*, but differs in that (1) the margin is stated to terminate in spines, (2) the spores are somewhat smaller, measuring 4–5 × 1.5–2 μ, and (3) the hyphae are said to be rarely thin-walled. It is hard to say whether these differences are of any consequence, or whether perhaps they are coupled with others as yet not apparent from the description. One of the features, for instance, about which information is badly needed, is the presence or absence of clamp connections on the hyphae of the flesh and at the base of the basidia. Pending the comparison of *Mycoleptodonoides aitchisonii* and *M. vassiljevae*, identification of both species seems premature.

I am very much obliged to Mr. D. A. Reid, The Herbarium, Royal Botanic Gardens, Kew, for correction of the English text.

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USNEAE A R. A. MAAS GEESTERANUS IN AFRICA ORIENTALI ET AUSTRALI ANNO 1949 COLLECTAE

Józef Motyka
Lublin, Polonia

Enumeratio Usnearum in Africa orientali et australi collectarum datur. Tres species novae, *Usnea aristata*, *U. asteriza*, *U. coniungens* describentur, et tres varietates novae, *Usnea asteriza* var. *incolorata*, var. *trachyna*, *U. vesiculata* var. *venulosa*.
Usnea pulvinata var. *transvaalensis* combinatio nova proponitur.

Cl. D. Dr. R. A. Maas Geesteranus, Leiden, collectionem pulchram plantarum e Lichenum genere *Usnea*, in Kenya et in Africa australi collectam, benevolentissime mihi communicavit; pro communicatione eius collectionis meas gratias exprimere sit mihi permissum. In hac collectione plantas bene notas ex Africa australi inveni, quarum novae stationes de earum distributione docent. Quae sunt cum plantis nobis notis exacte identicae. Evidenter species generis *Usnea* in Africa australi paulo sunt variabiles.

Plantae in Kenya collectae nonnullae ad species iam descriptas pertinent, pro parte vero non erant adhuc notae. Tres species novas et nonnullas varietates decribere necesse erat. Typi novorum taxonum in "Rijksherbarium", Leiden, syntypi in herbario nostro asservantur.

Plures species generis *Usnea* in Africa centrali et orientali evidenter tantum in montibus altissimis, in silvis montanis tropicis vel subtropicis vigent. Sat bene haec in Kilimandjaro, Ruwenzori, in territorio Virunga, minus bene in montibus aliis exploratae sunt. Quarum omnes in typis et numerosis aliis speciminibus nobis notae sunt. In Kenya plantae paucae adhuc collectae erant, qua re collectio nunc elaborata nostram cognitionem specierum generis *Usnea* in Africa orientali amplificat.

Plures species generis *Usnea* in pluribus montibus altissimis Africae centralis inventae sunt, nonnullae tantum in singulis territoriis. Memorabile fere omnes species late distributae non sunt exacte in singulis territoriis identicae, etsi ad easdem species pertinent. Evidenter varietates vel formae in singulis territoriis formantur, adeo vero subtiles, ut tantum in comparatione ipsarum plantarum dignotae esse possunt. Quarum distinctiores descriptae sunt, aliae tantum ut typicae—id est cum typis identicae—,vel a typo differentes commemoratae sunt.

Subgenus Eumitria (Stirt.) Mot.

Eumitria Stirt. *in* Scot. Nat. **6**: 100. 1881. — *Usnea* subgenus *Eumitria* (Stirt.) Mot., Lich. Gen. *Usnea* Stud. mon. **1**: 49. 1936.

Usnea cristata Mot.

Usnea cristata Mot., Lich. Gen. *Usnea* Stud. mon. **1**: 52. 1936.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11043*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L).

USNEA IMPLICITA (Stirt.) Zahlbr.

Eumitria implicita Stirt. *in* Scot. Nat. **6**: 100. 1881. — *Usnea implicita* (Stirt.) Zahlbr., Cat. Lich. univ. **6**: 582. 1930.

UNION OF SOUTH AFRICA: Cape Province, Knysna, Garden of Eden, 2 Dec. 1949, *Maas Geesteranus 12028*, on branch of *Podocarpus* at edge of clearing in tall forest, sheltered, c. 500 m alt. [*U. rubescens* immixta] (L).

Subgenus EUUSNEA Jatta

Usnea subgenus *Euusnea* Jatta *in* Malpighia **12**: 161. 1898.

Sectio FOVEATAE Mot.

Sectio *Foveatae* Mot., Lich. Gen. *Usnea* Stud. mon. **1**: 72. 1936.

USNEA CORRUGATA Mot.

Usnea corrugata Mot., Lich. Gen. *Usnea* Stud. mon. **1**: 105. 1936.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11049b*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L).

USNEA LEPROSA Mot.

Usnea leprosa Mot., Lich. Gen. *Usnea* Stud. mon. **1**: 106. 1936.

KENYA: Rift Valley Province, District of Nakuru, Menengai, 7 May 1949, *Maas Geesteranus 4536*, on *Acacia* in open grassy plain, 2000 m alt. (L); between Menengai and Rongai, 8 May 1949, *Maas Geesteranus*, on *Acacia* sp. in open wood, 1800 m alt. [*U. perspinosae*, No. *10285*, admixta]; Trans Nzoia District, Cherangani Mts., 22 May 1949, *Maas Geesteranus 4807*, in densely wooded ravine, shaded, 2500–2700 m alt. (L); Nyanza Province, District of Kisumu-Londiani, Londiani, 9 June 1949, *Maas Geesteranus 10953*, *10954* (on *Acacia lahai*), *10979* (on various trees) at edge of forest, exposed, 2300 m alt. (L); District of Kisumu-Londiani, Tinderet Forest Reserve, 0°5′ S. 35°27′ E., 14 June 1949, *Maas Geesteranus 10996*, on *Acacia lahai* at edge of forest, fairly sheltered, 2260 m alt. (L); Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11051*, *11064b*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L); eodem loco etiam *U. intumescenti*, No. *11049a*, admixta; Tinderet Forest Reserve, 0°6′10″ S. 35°22′30″ E., 1 July 1949, *Maas Geesteranus 5357*, on *Olea hochstetteri* in dense tall forest, shaded, 2300–2400 m alt. (L); Tinderet Reserve, 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus 5555*, *5557*, *5559*, on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. [No. *5559 U. vainioana* immixta] (L); eodem loco etiam *U. aristatae*, No. *5556*, admixta; between Tinderet Forest Reserve and Equator, 0°0′37″ N. 35°32′ E., 28 July 1949, *Maas Geesteranus 5583*, on isolated *Lasiosiphon glaucus* near edge of bamboo grove, exposed, 3200 m alt. (L).

Species nota e sat numerosis stationibus in tota fere Africa subtropica et tropica locis editioribus, Madagascar et ins. Comoro. Medulla Pd non colorata.

Sectio ARTICULATAE Mot.

Sectio *Articulatae* Mot., Lich. Gen. *Usnea* Stud. mon. **1**: 110. 1936.

USNEA PRAELONGA Stirt.

Usnea praelonga Stirt. *in* Scot. Nat. **6**: 107. 1881.

UNION OF SOUTH AFRICA: Transvaal, between Sabie and Lijdenburg, Mt. Anderson, 27 Oct. 1949, *Maas Geesteranus 11921* (on trees in narrow, wooded ravine, sheltered), *11943* (on small tree in remnant of wood on slope), c. 2000 m alt. (L); eodem loco etiam *U. torquescenti*, No. *11942*, tamquam *U. undulatae*, No. *11941*, admixta.

Identica cum typo. Nota adhuc e pluribus stationibus in Africa australi, Erythraea et Somali.

USNEA RUGOSA Mot.

Usnea rugosa Mot., Lich. Gen. *Usnea* Stud. mon. **1**: 113. 1936.

KENYA: Nyanza Province, District of Kisumu-Londiani, Londiani, 9 June 1949, *Maas Geesteranus 10981*, on tree at edge of forest, exposed, 2300 m alt. [*U. decipiens* immixta] (L); District of Kisumu-Londiani, Tinderet Forest Reserve, 0°5′ S. 35°27′ E., 14 June 1949, *Maas Geesteranus 10994*, *10998*, on *Acacia lahai* at edge of forest, fairly sheltered, 2260 m alt. [No. *10998 U. perspinosa* et *U. flavescens* immixtae] (L); eodem loco etiam *U. flavescenti*, No. *10993*, admixta; Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. [*U. intumescenti*, No. *11049a*, admixta]; Rift Valley Province, Nakuru District, Eastern Mau Forest Reserve, 0°22′30″ S. 35°43′ E., 25 Aug. 1949, *Maas Geesteranus*, on *Juniperus procera* at edge of tall forest, exposed, 2750 m alt. [*U. flavescenti*, No. *5863*, admixta]; Eastern Mau Forest Reserve, 0°28′ S. 35°45′ E., 31 Aug. 1949, *Maas Geesteranus 11413*, on wood of dead *Juniperus procera* at edge of forest near Songai River, 2650 m alt. [*U. flaccida* immixta] (L).

Plantae e Kenya sat distincte recedunt a typo ramis rarius rugulosis, rugulis maioribus, acute prominentibus, in pseudocyphellas transientibus, et sat distincte ad *U. praelongam* accedunt.

Plantae, *U. intumescenti* (No. *11049a*) admixtae, e forma constant recedente a typo ramis fere laevibus, pseudocyphellatis, accedente ad *U. flavescentem*. Plantae Nrs. *11413* magis quam aliae e Kenya typo similes.

USNEA VESICULATA Mot.

Usnea vesiculata Mot., Lich. Gen. *Usnea* Stud. mon. **1**: 114. 1936.

Var. **venulosa** Mot., *nova var.*

Habitu typo similis, sed rami imprimis crassiores sat crebre subtiliter acute venulosi, venulis varie percurrentibus, tenuibus, elevatulis, nunc longitudinalibus, nunc obliquis, pro parte paulo elongatis, pro parte fere punctiformibus, nunc thallo concoloribus, nunc paulo pallidioribus. Sterilis. Medulla Pd rubescens.

Typus: *Maas Geesteranus 5559*, pro parte (L).

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus 5559* [typus, pro parte, var. *perpendula* et var. *miniata* immixtae], *5562*, on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. (L).

Var. PERPENDULA Mot.

Usnea vesiculata var. *perpendula* Mot. *in* Ann. Univ. M. Curie-Skłodowska (Sect. C) **11**: 109. 1959.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus*, on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. [var. *venulosae*, No. *5559*, admixta].

Plantae identicae cum typo. Collectae unacum var. *venulosa*.

Var. MINIATA Mot.

Usnea vesiculata var. *miniata* Mot. *in* Ann. Univ. M. Curie-Skłodowska (Sect. C) **11**: 109. 1959.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus*, on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. [var. *venulosae*, No. *5559*, admixta].

Identica cum typo. Collecta unacum var. *venulosa*.

USNEA FLAVESCENS Mot.

Usnea flavescens Mot., Lich. Gen. *Usnea* Stud. mon. **1**: 125. 1936.

KENYA: Rift Valley Province, Trans Nzoia District, Cherangani Mts., 22 May 1949, *Maas Geesteranus 4808*, densely wooded ravine, 2500–2700 m alt. (L); Nyanza Province, District of Kisumu-Londiani, Londiani, 9 June 1949, *Maas Geesteranus 10980*, on trees at edge of forest, exposed, 2300 m alt. [minus evoluta] (L); District of Kisumu-Londiani, Tinderet Forest Reserve, 0°5′ S. 35°27′ E., 14 June 1949, *Maas Geesteranus 10993*, on *Acacia lahai* at edge of forest, fairly sheltered, 2260 m alt. [typica; *U. rugosa* immixta] (L); eodem loco etiam *U. os-elephantis* var. *subdecipienti*, No. *10995*, tamquam *U. rugosae*, No. *10998*, admixta; Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11041*, *11054*, *11059*, *11064a*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. [No.*11059*, *11064a* sat parce evolutae] (L); eodem loco etiam *U. durae*, No. *11047*, tamquam *U. moniliformi*, No. *11038*, admixta; Tinderet Forest Reserve, 0°6′10″ S. 35°22′30″ E., 1 July 1949, *Maas Geesteranus 11123*, on *Acacia lahai* at edge of forest, somewhat exposed, 2000 m alt. [plantae parce evolutae, sorediosae] (L); Tinderet Forest Reserve, 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus 5548* [typica], *5552* [accedens ad *U. rugosam*], *5561*, on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. (L); eodem loco etiam *U. asterizae*, No. *5553*, tamquam *U. exasperatae*, No. *5551*, admixta; Rift Valley Province, Nakuru District, Eastern Mau Forest Reserve, 0°22′30″ S. 35°43′ E., 25 Aug. 1949, *Maas Geesteranus 5861a* (mainly on *Juniperus procera*, also on *Dombeya*, *Ekebergia*, *Olea chrysophylla*, etc. [planta typica, cum apotheciis]), *5863* [*U. rugosa* immixta], at edge of tall forest, exposed, 2750 m alt. (L); eodem loco etiam *U. vainioanae*, No. *5861b*, admixta; Eastern Mau Forest Reserve, 0°28′ S. 35°45′ E., 31 Aug. 1949, *Maas Geesteranus 6076*, *6077*, on wood of dead *Juniperus procera* at edge of forest near Songai River, 2650 m alt. (L); eodem loco etiam *U. aequatorianae*, No. *11414*, admixta.

Sectio SETULOSAE Mot.

Sectio *Setulosae* Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 305. 1937.

USNEA PULVINATA var. **transvaalensis** (Vain.) Mot., *nova comb.*

Usnea transvaalensis Vain. *in* Ann. Univ. åbo. (turku.) (Ser. A) **2** (3): 1. 1926 (basionym).

UNION OF SOUTH AFRICA: O r a n g e F r e e S t a t e, 5 miles west of Ladybrand, 18 Nov. 1949, *Maas Geesteranus 6526*, on vertical face of sandstone outcrop, exposed to S, c. 2000 m alt. (L); C a p e P r o v i n c e, Franschhoekpas between Franschhoek and Villiersdorp, 27 Nov. 1949, *Maas Geesteranus 6583*, on vertical sides of boulders in stream in wooded ravine, 600–900 m alt. (L).

Plantae ex Africa australi quam typus distincte semper maiores sunt et pro varietate distinguendae.

USNEA MYRIOCLADA (Müll. Arg.) Zahlbr.

Usnea barbata var. *myrioclada* Müll. Arg. *in* Bot. Jb. **20**: 244. 1894. — *Usnea myrioclada* (Müll. Arg.) Zahlbr., Cat. Lich. univ. **6**: 558. 1930.

UNION OF SOUTH AFRICA: C a p e P r o v i n c e, Knysna District, Deepwalls Forest Reserve, north of Knysna, 5 Dec. 1949, *Maas Geesteranus 6691*, *6693*, on *Ocotea bullata* in clearing in tall forest, c. 500 m alt. (L).

USNEA ERUBESCENS (Stein apud H. Meyer) Mot.

Usnea articulata f. *erubescens* Stein *apud* H. Meyer, Ost-afrik. Gletscherfahrt. 314. 1890. — *Usnea erubescens* (Stein apud H. Meyer) Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 333. 1937.

KENYA: N y a n z a P r o v i n c e, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 13034*, on low tree at edge of forest, exposed, 2420 m alt. (L).

USNEA SPILOTA Stirt.

Usnea spilota Stirt. *in* Scot. Nat. **6**: 294. 1882.

UNION OF SOUTH AFRICA: C a p e P r o v i n c e, Tzitzikama Mts., Plaat Forest near Storms River, 3 Dec. 1949, *Maas Geesteranus 12103*, on tree at edge of clearing in tall forest, c. 200 m alt. (L).

Plantae sat distincte accedentes ad *U. rubescentem*, subarticulatae.

USNEA HORRIDULA (Müll. Arg.) Mot.

Usnea longissima var. *horridula* Müll. Arg. *in* Flora **74**: 372. 1891. — *Usnea horridula* (Müll. Arg.) Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 334. 1937.

UNION OF SOUTH AFRICA: T r a n s v a a l, between Sabie and Lijdenburg, Mt. Anderson, 27 Oct. 1949, *Maas Geesteranus 11940*, on small tree in remnant of wood on slope, c. 2000 m alt. (L); eodem loco etiam *U. undulatae*, No. *11941*, admixta.

USNEA MACULATA Stirt.

Usnea maculata Stirt. *in* Scot. Nat. **6**: 293. 1882.

UNION OF SOUTH AFRICA: C a p e P r o v i n c e, Franschhoekpas between Franschhoek and Villiersdorp, 27 Nov. 1949, *Maas Geesteranus 6582*, on vertical face of rock in stream in wooded ravine, 600–900 m alt. [exacte typica] (L); Knysna District, Ruigtevlei between Geòrge and Knysna, 1 Dec. 1949, *Maas Geesteranus 12007*, on spiny twigs of trees at edge of wood near lake, exposed, c. sea level [*U. undulata* immixta] (L).

Plantae parce evolutae, typicae.

USNEA RUBESCENS Stirt.

Usnea rubescens Stirt. *in* Scot. Nat. **7**: 76. 1883.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 13504*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. [juvenilis] (L).

UNION OF SOUTH AFRICA: Cape Province, Knysna District, Ruigtevlei between George and Knysna, 1 Dec. 1949, *Maas Geesteranus 12004*, *12006*, on spiny twigs of trees at edge of wood near lake, exposed, c. sea-level (L); Knysna, Garden of Eden, 2 Dec. 1949, *Maas Geesteranus*, on branch of *Podocarpus* at edge of clearing in tall forest, sheltered, c. 500 m alt. [*U. implicitae*, No. *12028*, admixta]; Deepwalls Forest Reserve, north of Knysna, 5 Dec. 1949, *Maas Geesteranus 6688*, on *Ocotea bullata* in clearing in tall forest, c. 500 m alt. [plantae exacte typicae et bene evolutae] (L); eodem loco etiam *U. torquescenti*, No. *6695*, tamquam *U. luteolae*, No. *6696*, admixta.

USNEA DURA Mot.

Usnea dura Mot. *in* Ann. Univ. M. Curie-Skłodowska (Sect. C) **11**: 116. 1959.

KENYA: Nyanza Province, District of Kisumu-Londiani, Londiani, 9 June 1949, *Maas Geesteranus 10956*, *10957*, *10958* (on *Acacia lahai*), *10983* (on tree), at edge of forest, exposed, 2300 m alt. (L); Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11047* [*U. flavescens* immixta], *11060* [*U. os-elephantis* juvenilis immixta], on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of wood, exposed, 2420 m alt. (L); eodem loco etiam *U. flavescenti*, No. *11059*, admixta; Kericho District, South Western Mau Forest Reserve, 0°36′30″ S. 35°18′20″ E., 13 Aug. 1949, *Maas Geesteranus 11283*, on tree at edge of forest bordering Itare River, somewhat shaded, 1920 m alt. (L).

Plantae e Kenya sat distincte recedunt a typo in Virunga collecto thallo minus duro, cortice tenuiore, soraliis minus crebris, ad partes adapicales ramorum tantum sitis. Thallus et medulla Pd lutescentes.

Possibiliter var. propria, sed plantae nimium parce collectae ad varietatem describiendam.

USNEA DICHROA Mot.

Usnea dichroa Mot. *in* Ann. Univ. M. Curie-Skłodowska (Sect. C) **11**: 118. 1959.

KENYA: Nyanza Province, District of Kisumu-Londiani, between Tinderet Forest Reserve and Equator, 0°0′37″ N. 35°22′ E., 28 July 1949, *Maas Geesteranus 5584*, on isolated *Lasiosiphon glaucus* near edge of bamboo grove, exposed, 3200 m alt. (L); eodem loco etiam *U. perspinosae*, No. *11201*, admixta.

Var. SPINULOSA Mot.

Usnea dichroa var. *spinulosa* Mot. *in* Ann. Univ. M. Curie-Skłodowska (Sect. C) **11**: 120. 1959.

UNION OF SOUTH AFRICA: Cape Province, Knysna District, Ruigtevlei between George and Knysna, 1 Dec. 1949, *Maas Geesteranus 12005*, on spiny twigs of tree at edge of wood near lake, exposed, c. sea-level (L).

Plantae intense rubricosae, habitu similes *U. subfloridae*. Structura anatomica sicut in typo.

Sectio ELONGATAE Mot.

Sectio *Elongatae* Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 352. 1937.

USNEA DISTENSA Stirt.

Usnea distensa Stirt. *in* Scot. Nat. **6**: 104. 1882.

UNION OF SOUTH AFRICA: Transvaal, between Sabie and Lijdenburg, Mt. Anderson, 27 Oct. 1949, *Maas Geesteranus 11939*, on small tree in remnant of a wood on slope, c. 2000 m alt. [exacte typica] (L); Cape Province, Knysna District, Deepwalls Forest Reserve, north of Knysna, 5 Dec. 1949, *Maas Geesteranus 12224*, on *Podocarpus falcatus* in clearing in tall forest, c. 500 m alt. (L).

USNEA PROMONTORII Mot.

Usnea promontorii Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 386. 1937.

UNION OF SOUTH AFRICA: Cape Province, Knysna District, Knysna, Garden of Eden, 2 Dec. 1949, *Maas Geesteranus 12023, 12024* [*U. trichodeoides* immixta], *12025, 13035* [*U. trichodeoides* immixta], on branches of *Podocarpus* at edge of clearing in tall forest, sheltered, c. 500 m alt. (L); Tzitzikama Mts., Plaat Forest near Storms River, 3 Dec. 1949, *Maas Geesteranus 12104*, on tree at edge of clearing in tall forest, c. 200 m alt. (L); Knysna District Deepwalls Forest Reserve, north of Knysna, 5 Dec. 1949, *Maas Geesteranus 6689, 6690, 6699* (all on *Ocotea bullata*), *12223* (on *Podocarpus falcatus*), in clearing in tall forest, c. 500 m alt. (L).

USNEA LYNGEI Mot.

Usnea lyngei Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 411. 1937.

UNION OF SOUTH AFRICA: Cape Province, Knysna District, Ruigtevlei between George and Knysna, 1 Dec. 1949, *Maas Geesteranus 12009*, on tree at edge of wood near lake, exposed, c. sea-level (L).

USNEA LIVIDA Mot.

Usnea livida Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 419. 1937.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11037*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. [*U. vainioana* immixta] (L); Tinderet Forest Reserve, 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus 5554*, on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. (L).

Nota erat adhuc tantum e Cameroon.

USNEA TRICHODEOIDES Vain. em. Mot.

Usnea trichodeoides Vain. *in* Ann. Acad. Sci. fenn. (Ser. A) No. 7: 7. 1915; em. Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 421. 1937.

UNION OF SOUTH AFRICA: Cape Province, Knysna District, Knysna, Garden of Eden, 2 Dec. 1949, *Maas Geesteranus 12026* [planta exacte typica; *U. indigena* immixta], *13036*, on branches of *Podocarpus* at edge of clearing in tall forest, sheltered, c. 500 m alt. (L); eodem loco etiam *U. indigenae*, No. *12027b*, *U. os-elephantis*, No. *12021*, tamquam *U. promontorii*, No. *12024, 13035*, admixta; Tzitzikama Mts., Plaat Forest near Storms River, 3 Dec. 1949, *Maas Geesteranus 12106*, on branches of tree at edge of clearing in tall forest, c. 200 m alt. [planta exacte typica] (L).

USNEA INDIGENA Mot.

Usnea indigena Mot. *in* Fragm. flor. geobot. **1** (2): 27. 1954.

UNION OF SOUTH AFRICA: Cape Province, Knysna District, Knysna, Garden of Eden, 2 Dec. 1949, *Maas Geesteranus 12022*, *12027b* [*U. trichodeoides* immixta], on branches of *Podocarpus* at edge of clearing in tall forest, sheltered, c. 500 m alt. (L); eodem loco etiam *U. trichodeoidei*, No. *12026*, admixta.

USNEA EBURNEA Mot.

Usnea eburnea Mot. *in* Fragm. flor. geobot. **1** (2): 29. 1954.

UNION OF SOUTH AFRICA: Cape Province, Knysna District, Knysna, Garden of Eden, 2 Dec. 1949, *Maas Geesteranus 12027a*, on branches of *Podocarpus* at edge of clearing in tall forest, sheltered, c. 500 m alt. (L); Tzitzikama Mts., Plaat Forest near Storms River, 3 Dec. 1949, *Maas Geesteranus 12105*, on tree at edge of clearing in tall forest, c. 200 m alt. (L).

USNEA OS-ELEPHANTIS Mot.

Usnea os-elephantis Mot. *in* Ann. Univ. M. Curie-Skłodowska (Sect. C) **11**: 130. 1959.

Plantae e Kenya sat distincte a typo in Virunga collecto colore fusco, ramis plerumque sat crebre annulato-fractis recedunt. Sunt fere intermediae cum *U. aequatoriana*, *U. flaccida*, nonnullae cum *U. exasperata*, tamen varietates similes ut in Virunga formant. Ulterius tractandae, sinon melius pro specie autonoma separandae.

Var. OS-ELEPHANTIS

Usnea os-elephantis var. *os-elephantis*; Mot. *in* Ann. Univ. M. Curie-Skłodowska (Sect. C) **11**: 131. 1959.

KENYA: Nyanza Province, District of Kisumu-Londiani, Londiani, 9 June 1949, *Maas Geesteranus*, on tree at edge of forest, exposed, 2300 m alt. [*U. durae*, No. *10983*, admixta]; Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11039*, *11046a*, *13040*, *13503*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L); eodem loco etiam *U. durae*, No. *11060*, admixta; Tinderet Forest Reserve, 0°6′10″ S. 35°22′30″ E., 1 July 1949, *Maas Geesteranus 11102* (in dense, tall forest, 2300–2400 m alt.), *11126* (on *Acacia lahai* at edge of forest, 2000 m alt.) (L); Kericho District, South Western Mau Forest Reserve, 0°36′30″ S. 35°18′20″ E., 13 Aug. 1949, *Maas Geesteranus*, on tree at edge of forest bordering Itare River, somewhat shaded, 1920 m alt. [*U. intumescenti*, No. *11282*, admixta]; Rift Valley Province, Nakuru District, Eastern Mau Forest Reserve, 0°22′30″ S. 35°43′ E., 25 Aug. 1949, *Maas Geesteranus 5864*, on *Juniperus procera* at edge of forest, exposed, 2750 m alt. [*U. flaccida* immixta] (L).
UNION OF SOUTH AFRICA: Cape Province, Knysna District, Knysna, Garden of Eden, 2 Dec. 1949, *Maas Geesteranus 12021*, on branches of *Podocarpus* in clearing in tall forest, sheltered, c. 500 m alt. [*U. trichodeoides* immixta] (L).

Plantae e Kenya sub No. *11039* fere typicae, habitu cum typo bene congruentes sed fusco coloratae. Pars plantarum ad *U. flaccidam* accedit. No. *11046a* sat distincte ad *U. aequatorianam* accedit, forma transitoria ad *U. flaccidam*.

Var. SUBDECIPIENS Mot.

Usnea os-elephantis var. *subdecipiens* Mot. *in* Ann. Univ. M. Curie-Skłodowska (Sect. C) **11**: 132. 1959.

KENYA: Nyanza Province, District of Kisumu-Londiani, Londiani, 9 June 1949, *Maas Geesteranus 10982*, on *Acacia lahai* at edge of forest, exposed, 2300 m alt. (L); Tinderet

Forest Reserve, 0°5′ S. 35°27′ E., 14 June 1949, *Maas Geesteranus 10995*, on *Acacia lahai* at edge of forest, fairly sheltered, 2260 m alt. [*U. flavescens* immixta]; Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. [*No. 11052*, *U. asterizae* var. *trachynae* admixta] (L); eodem loco etiam *U. flavescenti*, No. *11059*, admixta; Tinderet Forest Reserve, 0°6′10″ S. 35°22′30″ E., 1 July 1949, *Maas Geesteranus 11122*, on *Acacia lahai* at edge of forest, 2000 m alt. (L); Tinderet Forest Reserve, 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus 5560*, on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. (L).

Plantae sat distincte recedentes a typo, medulla Pd non colorata, ramis sat tenuibus, acute angulatis. Verosimiliter varietas propria.

Var. TENERA Mot.

Usnea os-elephantis var. *tenera* Mot. *in* Ann. Univ. M. Curie-Skłodowska (Sect. C) **11**: 134. 1959.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11048*, *11063*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L).

Sectio STRAMINEAE Mot.

Sectio *Stramineae* Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 432. 1937.

USNEA DELICATA Vain.

Usnea delicata Vain. *in* Ann. Univ. åbo. (turku.) (Ser. A) **2** (3): 1. 1926.

UNION OF SOUTH AFRICA: Cape Province, Knysna District, Ruigtevlei between George and Knysna, 1 Dec. 1949, *Maas Geesteranus*, on twigs of tree at edge of wood near lake, exposed, c. sea-level [*U. undulatae*, No. *12015*, admixta]; Tzitzikama Mts., Plaat Forest near Storms River, 3 Dec. 1949, *Maas Geesteranus 12102*, on tree at edge of clearing in tall forest, c. 200 m alt. (L).

USNEA VAINIOANA Zahlbr.

Usnea vainioana Zahlbr., Cat. Lich. univ. **6**: 597. 1930.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°5′ S. 35°27′ E., 14 June 1949, *Maas Geesteranus 10997*, on *Acacia lahai* at edge of forest, fairly sheltered, 2260 m alt. (L); Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. [*U. lividae*, No. *11037*, admixta]; Tinderet Forest Reserve, 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus*, on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. [*U. vesiculatae* var. *venulosae*, No. *5559*, admixta]; Rift Valley Province, Nakuru District, Eastern Mau Forest Reserve, 0°22′30″ S. 35°43′ E., 25 Aug. 1949, *Maas Geesteranus 5861b* [*U. flavescens* immixta] (also on *Dombeya*, *Ekebergia*, *Olea chrysophylla*, etc.), *5865*, on *Juniperus procera* at edge of tall forest, exposed, 2750 m alt. (L); Eastern Mau Forest Reserve, 0°28′ S. 35°45′ E., 2 Sept. 1949, *Maas Geesteranus 6063*, on tree at edge of forest near Songai River, exposed, 2650 m alt. [cum apotheciis] (L).

USNEA EXASPERATA (Müll. Arg.) Mot.

Usnea dasypogoides var. *exasperata* Müll. Arg. *in* Flora **73**: 336. 1890. — *Usnea exasperata* (Müll. Arg.) Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 440. 1937.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11057a*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L) eodem loco etiam *U. flavescenti*, No. *11059*, admixta; Tinderet Forest Reserve, 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus 5550, 5551* [*U. flavescens* immixta], on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. (L).

USNEA MONILIFORMIS Mot.

Usnea moniliformis Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 447. 1937.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11038* [*U. flaccida* et *U. flavescens* immixtae], *11056*, *11057b*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L); eodem loco etiam *U. aequatorianae*, No. *11061*, *U. flaccidae*, No. *11062*, tamquam *U. asterizae* var. *trachynae*, No. *11052*, admixta; Rift Valley Province, Nakuru District, Eastern Mau Forest Reserve, 0°22′30″ S. 35°43′ E., 25 Aug. 1949, *Maas Geesteranus 5862*, on tree at edge of tall forest, exposed, 2750 m alt. [accedit ad *U. fuscam*] (L).

UNION OF SOUTH AFRICA: Transvaal, between Sabie and Lijdenburg, Mt. Anderson, 27 Oct. 1949, *Maas Geesteranus 11920*, on tree in narrow wooded ravine, sheltered, c. 2000 m alt. [forma ramulis teretibus] (L).

USNEA FLACCIDA (Müll. Arg.) Mot.

Usnea angulata var. *flaccida* Müll. Arg. *in* Flora **71**: 357. 1890. — *Usnea flaccida* (Müll. Arg.) Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 475. 1937.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11045*, *11062* [*U. moniliformis* immixta], on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L); eodem loco etiam *U. moniliformi*, No. *11038*, admixta; Rift Valley Province, Nakuru District, Eastern Mau Forest Reserve, 0°22′30″ S. 35°43′ E., 25 Aug. 1949, *Maas Geesteranus 5860b*, on *Juniperus procera* at edge of tall forest, exposed, 2750 m alt. (L); eodem loco etiam *U. os-elephantis*, No. *5864*, admixta; Eastern Mau Forest Reserve, 0°28′ S. 35°45′ E., 31 Aug. 1949, *Maas Geesteranus*, on wood of dead *Juniperus procera* at edge of forest near Songai River, 2650 m alt. [*U. rugosae*, No. *11413*, admixta].

USNEA AEQUATORIANA Mot.

Usnea aequatoriana Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 476. 1937.

KENYA: Nyanza Province, District of Kisumu-Londiani, Londiani, 9 June 1949, *Maas Geesteranus 10955* (on *Acacia lahai*), *10985* [*U. undulata* immixta] (on tree) at edge of forest, exposed, 2300 m alt. (L); Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11046b*, *11053a*, *11061* [*U. moniliformis* immixta], on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L); Tinderet Forest Reserve, 0°6′10″ S. 35°22′30″ E., 1 July 1949, *Maas Geesteranus 11121*, *11127*, on *Acacia lahai* at edge of forest, somewhat exposed, 2000 m alt. (L); Tinderet Forest Reserve, 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus*, on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. [typica, sterilis; *U. intumescenti*, No. *5558*, admixta]; Rift Valley Province, Nakuru District, Eastern Mau Forest Reserve, 0°28′ S. 35°45′ E., 31 Aug. 1949, *Maas Geesteranus 11414*, on wood of dead *Juniperus procera* at edge of forest near Songai River, 2650 m alt. [typica, sterilis; *U. flavescens* immixta] (L); eodem loco etiam *U. flavescenti*, No. *6077*, admixta.

Plantae e No. *11953a* parce ramulosae vel fere subnudae, crebre annulato-fractae, annulis minus distincte angulatis, pro parte fere teretibus, sat distincte accedentes ad *U. moniliformem*.

USNEA DECIPIENS Mot.

Usnea decipiens Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 477. 1937.

KENYA: NYANZA PROVINCE, District of Kisumu-Londiani, Londiani, 9 June 1949, *Maas Geesteranus* 11055, on tree at edge of forest, exposed, 2320 m alt. [*U. russae*, No. *10981*, admixta], Tinderet Forest Reserve, 0°6'30" S. 35°29' E., 20 June 1949, *Maas Geesteranus* 11055, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L.); RIFT VALLEY PROVINCE, Nakuru District, Eastern Mau Forest Reserve, 0°28' S. 35°35' E., 31 Aug. 1949, *Maas Geesteranus* 11412, on wood of dead *Juniperus procera* at edge of forest near Songai River, 2650 m alt. [plantae fere sine ramulis lateralibus] (L.).

Plantae e Kenya sat distincte recedunt a typo thallo distinctius articulato, articulis inflatulis, ramulis lateralibus raris, in nonnullis plantis fere vacantibus.

USNEA TORQUESCENS Stirt.

Usnea torquescens Stirt. *in* Trans. Proc. New Z. Inst. **30**: 391. (1897) 1898.

UNION OF SOUTH AFRICA: TRANSVAAL, between Sabie and Lijdenburg, Mt. Anderson, 27 Oct. 1949, *Maas Geesteranus* 11942, on small tree in remnant of a wood on slope, c. 2000 m alt. [*U. praeburgo* immixta] (L.); CAPE PROVINCE, Knysna District, Deepwalls Forest Reserve, north of Knysna, 5 Dec. 1949, *Maas Geesteranus* 6695, on *Ocotea bullata* in clearing in tall forest, c. 500 m alt. [*U. rubescens* immixta] (L).

Usnea asteriza Mot., *nova spec.*

Thallus elongatus, adultus 100 cm vel ultra longus, flaccide pendulus, parte basali indistincta, leviter obscurata affluxus, sat pallide fuscus, opacus, totus concolor, minus crebre, subdichotome vel saepius submonopodialiter ramosus, vulgo post ramificationem uno ramo firmiore et longiore, altero debiliore et breviore, ad basin arcuato deflexo, angulis inter ramos latis, rectis, subrectis vel perviis. Rami crassiores leviter longe flexuosi, tenuiores flaccide penduli, omnes sat uniformes, primarii ca. 2 mm vel paulo ultra crassi, longe crassitudine aequales, parte adapicali semim attenuati, ultimi crasse capillacei, omnes distinctissime angulati, in sectu fere articiformes, angulis prominentibus, dorso acutis et saepius serratis, illaque cortice tectis et non fractis neque dilaceratis, tantum hinc illinc pallidioribus et subcorticatis, lateribus inter angulos nunc sulcatis, nunc fere planis, nunc sulcatis sed media parte convexulis, laevibus, glabris, tantum passim levissime inaequalibus, nitidiuli, sat crebre annulato- vel subarticulato-fracti, fracturis nunc transversalibus, nunc obliquis, simplicibus, leviter limbatis, articulis non inflatis, contiguis vel sat disiunctis et tum fere semper regeneratis, maiores annulis deformibus, pallidioribus vel albidis, cortice regenerativa obtectis notati, ramulis lateralibus longioribus et brevioribus intermixtis, plerumque 0.5–1 cm longis, sed nonnullis longioribus vel brevioribus, perpendicularibus et strictis vel arcuato-flexuosis, vulgo simplicibus, sed maioribus iteratim ramosis, teretiusculis, sat crebre annulato-fractis, nonnullis maculis albidis notatis, maximis apothecia producentibus muniti. Summitates ramorum a ramis crassioribus fere non diversae.

Apothecia sat frequentia, ad ramos laterales lateraliter vel subterminaliter sita, 1–2 cm lata. Excipulum firmum, protinus convexum et laeve, postea distincte foveolatum rugisque sat acutis percussum, fere planum, ramulo firmo et longo,

vulgo ramuloso ex excipulo excrescente. Cilia e margine apotheciorum et e parte marginali excipuli excrescentia, vulgo numerosa, maiuscula, minora et minuta intermixta, maiora sat crebre annulata. Discus protinus concavus, postea fere planus, pallidus, sat distincte albo-pruinosus. Hypothecium ca. 35 μ crassum, fere pellucidum. Hymenium ca. 50 μ altum. Epithecium ca. 17 μ crassum, fuligineum. Asci clavati, ca. 50 × 20 μ. Sporae ca. 8 × 5 μ.

Structura anatomica. — Cortex ca. 130 μ crassus, extus stratu ca. 30 μ crasso sordide viridulus, intus pellucidus, versus medullam paulo inaequalis, paraplectenchymaticus, parte externa ex hyphis ad superficiem thalli fere perpendicularibus, valde conglutinatus, ex hyphis ca. 7 μ crassis contextus. Medulla 350-420 μ crassa, crebra, ex hyphis 7–15 μ crassis, strictis, pachydermaticis, dense tuberculatis contexta. Axis cylindricus, solidus, ca. 420 μ crassus, ex hyphis 3,5–7 μ crassis, sat leptodermaticis constructus, lumine cellularum sat lato.

Reactiones chimicae. — Medulla Pd rubescit vel non coloratur, K –.

Typus: *Maas Geesteranus 5860* (L).

Species distincta, insignis imprimis ramis valde distincte angulatis. Habitu externo maxime similis *U. alatae* ex America meridionali. *U. decipiens* est multo brevior, ramis potius sulcatis quam angulatis. *U. flaccida* differt ab *U. asteriza* thallo multo teneriore et tenuiter papillato-scabrido. In *U. goniodes* thallus est brevior, viridulus, opacus. *U. os-elephantis* diversa est ramis tantum crassioribus initiis angulorum notatis. *U. africana* et *U. gigas* colore viridulo, forma ramulorum et structura anatomica valde diversae sunt.

Species paulo variabilis, sed duo varietates distinctae notae sunt. In var. *asteriza* plantae sunt sat distincte diversae, quod tamen e modo crescendi evadit. Nonnullae plantae validae sunt, ramis primariis crassis et minus crebre ramulosis, apothecia numerosa et maiuscula producentes; haec verosimiliter e sporis natae sunt. Plantae aliae sunt tenuiores, crebre ramulosae, minus distincte, vel potius minus prominenter angulatae, crebrius ramulosae, plerumque tenuiores; haec sunt fere sine dubio plantae regenerative crescentes ex partis deruptis et per ramos arborum pendulae, porro crescentes, sine parte basali.

Var. **asteriza**

Ramuli laterales laeves, etuberculati, vulgo esorediosi. Plantae fere semper cum apotheciis. Medulla Pd rubescens.

Varietas typica speciei.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus 5553*, on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. [*U. flavescens* immixta] (L); Rift Valley Province, Nakuru District, Eastern Mau Forest Reserve, 0°22′30″ S. 35°43′ E., 25 Aug. 1949, *Maas Geesteranus 5860* [typus], on *Juniperus procera* at edge of tall forest, exposed, 2750 m alt. (L); Eastern Mau Forest Reserve, 0°28′ S. 35°45′ E., 31 Aug. 1949, *Maas Geesteranus 11415, 11416*, on wood of dead *Juniperus procera* at edge of forest near Songai River, 2650 m alt. (L).

Var. **incolorata** Mot., *nova var.*

Medulla Pd non tincta. Ceterum a var. *asteriza* non diversa.

Typus: *Maas Geesteranus 11040* (L).

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11040* [typus], on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L).

Var. **trachyna** Mot., *nova var.*

Ramuli laterales crebri, breves, tuberculati, tuberculis prominentibus, albis, sorediosis. Soredia isidiosa, tenuia, in nidulis astericiformibus sita. Apothecia sat rara, sicut in var. *asteriza*. Medulla Pd non tincta.

Typus: *Maas Geesteranus 11052*, pro parte.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11052* [typus, pro parte; *U. os-elephantis* var. *subdecipiens* et *U. moniliformis* immixtae], on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L).

Usnea coniungens Mot., *nova spec.*

Thallus pendulus, ca. 12 cm longus, sat late divergenter expansus, fere totus uniformiter stramineo-fuscus, ad ramos tantum tenuiores paulo pallidior, nitidulo-opacus, sat mollis, basi brevi, distincte constricta, angustissime obscurata et saepius basibus secundariis substratu affixus, in tota longitudine sat parce submonopodialiter et subdichotome ramosus, ramificatione plerumque irregulari, uno ramo post ramificationem plerumque validiore, altero debiliore, nunc elongato et pendulo, nunc brevi et patente, angulis inter ramos fere semper latis, rectis vel subrectis. Rami prope basin 2–3 mm crassi, mox supra basin attenuati et ad apices fere capillacei, teretes, inflati apparentes, crassissimi saepius sat profunde irregulariter foveolati, ad basin semper, alibi rare sed typice articulati, articulis ad ramos crassiores apicibus constrictis, ad tenuiores fere cylindricis, ad fracturas albo-limbati, laeves, epapillati, glabri, hinc illinc pseudocyphellis distinctis, nunc deformibus et maculiformibus, nunc distincte elevatis, dorsis acutis et albidis, nunc punctiformibus notati, locis nonnullis vero ecyphellati, ramulis lateralibus variae longitudinis et formae, nunc elongatis, pendulis, fere simplicibus et tum plerumque rarioribus, nunc brevibus, fere perpendicularibus, saepius iteratim ramosis, graciose vel spiratim flexuosis, vulgo crebre dispositis, sat distincte articulato-affixis, longe acute terminatis, subtiliter tuberculatis muniti. Summitates varie formatae, nunc sat longe capillaceae et fere nudae, nunc sat breves et crassae, ramulis lateralibus provisae.

Apothecia ignota.

Soredia isidiosa, minute spinuliformia, ad ramulos laterales in nidulis parvis vel simpliciter ad tubercula minuta, leviter elevata, post defectionem sorediorum farinosa, sat lata sita.

Structura anatomica. — Cortex 60–95 μ crassus, stratu externo ca. 15 μ crasso luteolus, intus pellucidus, paraplectenchymaticus, valde conglutinatus, ex hyphis ca. 15 μ crassis, lumine cellularum angusto contextus. Medulla ca. 250 μ crassa, sat crebra, ex hyphis ca. 5 μ crassis, laevibus, flexuosis contexta. Axis ca. 380 μ crassus, teres, solidus, ex hyphis maxime conglutinatis, ca. 7,5 μ crassis constructus.

Reactiones chimicae. — Thallus et medulla K–, Pd in typo non colorat, in syntypo-cum typo morphologice identico-medulla Pd lutescit et stratu externo rubescit.

Typus: *Maas Geesteranus 11044* (L).

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11044* [typus], *13038*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L).

Species insignis, sectiones *Articulatae*, *Stramineae* et *Glabratae* distincte iungens. Plantae iuniores fruticulosae sunt, divergenter ramosae, similes maiusculae *U. glabratae* vel *U. ruwenzorianae*, adultae pendulae, elongatae, sat similes *U. flavescenti*, sed ramulis lateralibus munitae sicut in pluribus speciebus e sectione *Stramineae*. Etiam pluribus speciebus e sectione *Cladocarpae* non dissimilis. Proxima videtur *U. flavescenti* imprimis habitu, pseudocyphellis, articulatione, diversa ab ea ramulis lateralibus numerosis, thallo breviore et magis inflato.

Species nota adhuc tantum e paucis speciminibus e Kenya.

Sectio GLABRATAE Mot.

Sectio *Glabratae* Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 483. 1937.

USNEA STRIGOSELLA Steiner

Usnea strigosella Steiner *in* Bull. Herb. Boissier, ser. 2, **7**: 637. 1907.

KENYA: Nyanza Province, District of Kisumu-Londiani, Londiani, 9 June 1949, *Maas Geesteranus 10984*, on tree at edge of forest, exposed, 2300 m alt. [*U. subleprosa* immixta] (L); Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. [*U. leprosae*, No. *11051*, admixta]; Tinderet Forest Reserve, 0°6′10″ S. 35°22′30″ E., 1 July 1949, *Maas Geesteranus 11124*, *11125*, on *Acacia lahai* at edge of forest, somewhat exposed, 2000 m alt. (L).

UNION OF SOUTH AFRICA: Cape Province, Knysna District, Deepwalls Forest Reserve, north of Knysna, 5 Dec. 1949, *Maas Geesteranus 6692* [*U. undulata* immixta], *12155*, *12157*, on *Ocotea bullata* in clearing in tall forest, c. 500 m alt. (L).

USNEA UNDULATA Stirt.

Usnea undulata Stirt. *in* Scot. Nat. **6**: 104. 1881.

KENYA: Nyanza Province, District of Kisumu-Londiani, Londiani, 9 June 1949, *Maas Geesteranus*, on tree at edge of forest, exposed, 2300 m alt. [*U. aequatorianae*, No. *10985*, admixta].

UNION OF SOUTH AFRICA: Transvaal, between Sabie and Lijdenburg, Mt. Anderson, 27 Oct. 1949, *Maas Geesteranus 11941*, on small tree in remnant of wood on slope, c. 2000 m alt. [*U. horridula*, *U. praelonga*, et *U. subleprosa* immixtae] (L); Cape Province, Knysna District, Ruigtevlei between George and Knysna, 1 Dec. 1949, *Maas Geesteranus 12008*, *12011*, *12012*, *12013*, *12014*, *12015* [*U. delicata* immixta], *12016*, *12017*, on trees at edge of wood near lake, exposed, c. sea-level (L); eodem loco etiam *U. maculatae*, No. *12007*, admixta; Deepwalls Forest Reserve, north of Knysna, 5 Dec. 1949, *Maas Geesteranus 6698*, *12156*, on *Ocotea bullata* in clearing in tall forest, c. 500 m alt. (L); eodem loco etiam *U. strigosellae* No. *6692* admixta.

Specimina cum typo exacte identica.

USNEA PERSPINOSA Mot.

Usnea perspinosa Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 533. 1937.

KENYA: Rift Valley Province, Nakuru District, between Menengai and Rongai, 8 May 1949, *Maas Geesteranus 10285*, on *Acacia* sp. in open wood, 1800 m alt. [*U. leprosa* immixta] (L); Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°5′ S. 35°27′ E., 14 June 1949, *Maas Geesteranus 10999*, on *Acacia lahai* at edge of forest, fairly sheltered, 2260 m alt. (L); eodem loco etiam *U. rugosae*, No. *10998*,

admixta; between Tinderet Forest Reserve and Equator, 0°0′37″ N. 35°32′ E., 28 July 1949, *Maas Geesteranus 11201*, on isolated *Lasiosiphon glaucus* near edge of bamboo grove, exposed, 3200 m alt. [*U. dichroa* immixta] (L).

USNEA SIMPLICISSIMA Mot.

Usnea simplicissima Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 538. 1937.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 13039*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L); Rift Valley Province, Nakuru District, Eastern Mau Forest Reserve, 0°28′ S. 35°45′ E., 2 Sept. 1949, *Maas Geesteranus 6064*, on tree at edge of forest near Songai River, exposed, 2650 m alt. (L).

USNEA SUBMOLLIS Steiner

Usnea submollis Steiner *in* Verh. zool.-bot. Ges. Wien **53**: 229. 1903.

KENYA: Rift Valley Province, Nakuru District, Eastern Mau Forest Reserve, 0°28′ S. 35°45′ E., 2 Sept. 1949, *Maas Geesteranus 6065*, on tree at edge of forest near Songai River, exposed, 2650 m alt. (L).

USNEA MOLLIUSCULA Stirt.

Usnea molliuscula Stirt. *in* Scot. Nat. **7**: 77. 1883.

UNION OF SOUTH AFRICA: Transvaal, between Sabie and Lijdenburg, Mt. Anderson, 27 Oct. 1949, *Maas Geesteranus 11922*, on tree in narrow wooded ravine, sheltered, c. 2000 m alt. (L).

USNEA CHRYSOLEUCA Mot.

Usnea chrysoleuca Mot. *in* Fragm. flor. geobot. **1** (2): 31. 1954.

UNION OF SOUTH AFRICA: Cape Province, Franschhoekpas between Franschhoek and Villiersdorp, 27 Nov. 1949, *Maas Geesteranus 6584, 11979*, on vertical sides of boulders in stream in wooded ravine, 600–900 m alt. (L).

Plantae cum typo habitu et structura, superficie et colore fere identicae, diversae vero soraliis farinosis, parte adapicali ramorum in soraliis minutis sitis. Nonnullae plantae sunt fere eramulosae, aliae ramulis lateralibus crebre munitae et sat similes *U. pulvinatae*. In collectione maiore verificandum, sinon valoris saltem varietatis sint dignae.

In Herbario Universitatis Harvard plantas identicas asservatas vidi ex insula St. Helena (in garden of Varneys, 23 Dec. 1957, *Arthur Loveridge*, substratum not indicated). Plantae evidenter terri- vel saxicolae.

USNEA LUTEOLA Mot.

Usnea luteola Mot. *in* Fragm. flor. geobot. **1** (2): 33. 1954.

UNION OF SOUTH AFRICA: Cape Province, Knysna District, Deepwalls Forest Reserve, north of Knysna, 5 Dec. 1949, *Maas Geesteranus 6694, 6696* [*U. rubescens* immixta], *6697*, on *Ocotea bullata* in clearing in tall forest, c. 500 m alt. (L).

Plantae e Knysna pro parte identicae cum typo e Madagascar, pro parte paulo ab eo diversae thallo rigidiore, ramis subtilius papillatis.

Usnea aristata Mot., *nova spec.*

Thallus ca. 7 cm longus et 12 cm latus, saepius distincte minor, pallide fusco-stramineus, ad partes apicales paullulum pallidior, sat distincte, imprimis ad ramos tenuiores, fere subpellucidus, nitidulus, mollis, flaccidus, subpendulus vel patente expansus, in tota longitudine crebre, plerumque dichotomice, rarius submonopodialiter ramosus, axillis inter ramos latis, rectis vel subrectis, parte basali attenuata, arcte constricta, concolore substratu affixus, statim supra basin ramificans. Rami parte suprabasali usque ad 3 mm crassi, mox sensim attenuati et ad apices sat abrupte subulato-attenuati, irregulariter, passim subsigmoideo-curvati, ad ramificationes et passim etiam alibi articulato-constricti vel fere typice articulati, medulla saepius e fracturis evadente, distincte inflatuli, crassiores saepius irregulariter foveolati indistincteque subtiliter subpapillati, tenuiores laeves, vulgo vero crebrius vel rarius tuberositatibus albidis, ecorticatis, sat distincte prominentibus, oblongis, transversis et obliquis, parte adapicali ramorum in soralia transientibus notati, parte suprabasali ramulis lateralibus tenuibus, ramis primariis similibus, apice acutiusculis, maioribus sorediosis muniti, parte adapicali et vulgo etiam mediali eramulosi.

Apothecia ignota.

Soredia parte adapicali ramorum crassiorum et parte mediali et adapicali ramorum tenuiorum crebre disposita, tenuiter granulosa vel granuloso-farinosa, e soraliis protinus punctiformibus, postea dilatatis, farinosis, indistincte limitatis, saepius dein erosulis nascentia, cito decadentia.

Structura anatomica. — Cortex ca. 60 μ crassus, luteolus, maxime conglutinatus, ex hyphis ca. 12 μ crassis contextus. Medulla 110–180 μ crassa, laxa, ex hyphis fere strictis, ca. 4 μ crassis laevibus complecta. Axis ca. 130 μ crassus.

Reactiones chimicae. — Thallus et medulla K non reagens, Pd rubescens.

Typus: *Maas Geesteranus 11050* (L).

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11050* [typus], on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L); Tinderet Forest Reserve 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus 5556*, on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. [*U. leprosa* immixta] (L).

U. aristata proxima est *U. ruwenzorianae*. Differt ab ea thallo multo maiore et ramis crassioribus, distincte saltem ad basin suam articulatis, nitidulis, colore fuscidulo et ramificatione densiore. Ab *U. undulata* soraliis farinosis soraliisque latioribus et ramulis lateralibus alio modo formatis diversa. A simili *U. pulverulenta* dispositione soralium, thallo multo maiore et toto habitu diversa. Maxime europaeam *U. glabratam* et *U. intextam* in memoriam revocat, est vero multo maior et sorediis diversa.

No. *5556* est forma paulo recedens a typo thallo fere non articulato, crebre ramulis lateralibus munito.

Sectio DENDRITICAE Mot.

Sectio *Dendriticae* Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 570. 1938.

USNEA SCUTATA Mot.

Usnea scutata Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 602. 1938.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°5′ S. 35°27′ E., 14 June 1949, *Maas Geesteranus 13502*, on *Acacia lahai* at edge of forest, fairly sheltered, 2260 m alt. (L); Tinderet Forest Reserve, 0°6′10″ S. 35°22′30″ E., 1 July 1949, *Maas Geesteranus 11128*, on *Acacia lahai* at edge of forest, somewhat exposed, 2000 m alt. (L).

Plantae nonnullae cum typo identicae, aliae ad *U. perspinosam* accedentes.

USNEA SUBLEPROSA Mot.

Usnea subleprosa Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 605. 1938.

KENYA: Nyanza Province, District of Kisumu-Londiani, Londiani, 9 June 1949, *Maas Geesteranus*, on tree at edge of forest, exposed, 2300 m alt. [*U. strigosellae*, No. *10984*, admixta]; Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. [*U. flavescenti*, No. *11054*, admixta].

UNION OF SOUTH AFRICA: Transvaal, between Sabie and Lijdenburg, Mt. Anderson, 27 Oct. 1949, *Maas Geesteranus*, on small tree in remnant of wood on slope, c. 2000 m alt. [*U. undulatae*, No. *11941*, admixta].

USNEA INTUMESCENS Mot.

Usnea intumescens Mot. *in* Ann. Univ. M. Curie-Skłodowska (Sect. C) **11**: 138. 1959.

KENYA: Nyanza Province, District of Kisumu-Londiani, Londiani, 9 June 1949, *Maas Geesteranus 10986*, on tree at edge of forest, exposed, 2300 m alt. [verosimiliter] (L); Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 11049a* [*U. leprosa* et *U. rugosa* immixtae], *11065*, on low trees and shrubs, mainly *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L); Tinderet Forest Reserve, 0°0′30″ N. 35°31′30″ E., 15 July 1949, *Maas Geesteranus 5558*, on *Arundinaria alpina* at edge of forest, exposed, 2700 m alt. [*U. aequatoriana* immixta] (L); between Tinderet Forest Reserve and Equator, 0°0′37″ N. 35°32′ E., 28 July 1949, *Maas Geesteranus 11202*, on isolated *Lasiosiphon glaucus* near edge of bamboo grove, exposed, 3200 m alt. (L); Kericho District, South Western Mau Forest, Reserve, 0°36′30″ S. 35°18′20″ E., 13 Aug. 1949, *Maas Geesteranus 11282*, on tree at edge of forest bordering the Itare River, somewhat shaded, 1920 m alt. [*U. os-elephantis* immixta] (L).

Sectio LAEVIGATAE Mot.

Sectio *Laevigatae* Mot., Lich. Gen. *Usnea* Stud. mon. **2**: 626. 1938.

USNEA ELEGANTISSIMA Mot.

Usnea elegantissima Mot. *in* Ann. Univ. M. Curie-Skłodowska (Sect. C) **11**: 148. 1959.

KENYA: Nyanza Province, District of Kisumu-Londiani, Tinderet Forest Reserve, 0°6′30″ S. 35°29′ E., 20 June 1949, *Maas Geesteranus 13037*, on *Tarchonanthus* sp. at edge of forest, exposed, 2420 m alt. (L).

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OBSERVATIONS ON GASTEROMYCETES–X

The Nidulariaceae in Persoon's herbarium

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(With 27 Text-figures)

The 31 collections of Nidulariaceae in Persoon's Herbarium, bearing 23 names in all, are revised into 8 species: *Crucibulum laeve* (Bull. ex DC.) Kambly, *Cyathus microsporus* Tul., *C. olla* (Batsch) ex Pers., *C. poeppigii* Tul., *C. stercoreus* (Schw.) De Toni, *C. striatus* (Huds.) ex Pers., *C. triplex* Lloyd and *Nidularia farcta* (Roth ex Pers.) Fr. Nine names are unpublished and hence nomina nuda. Six specimens appear to be of West Indian origin and two from Mauritius. As one West Indian specimen was named "*Nidularia Domingensis*", the type of *Cyathus microsporus* var. *domingensis* Tul., which is the type variety of the species, was examined and the two collections agree in most respects. However, the spores of *C. microsporus* are larger than is given in the literature. The spores of both *C. striatus* and *C. triplex* are reported to have a proximal notch which does not appear to have been previously reported.

Introduction.—Persoon (1801) published six species under the genus *Cyathus: C. striatus*, *C. olla*, *C. crucibulum*, *C. scutellaris*, *C. farctus* and *C. deformis*. He also placed *Cyathus nitidus* as a variety of *C. olla* and described a second variety, "*C. olla β. Cyathus agrestis*". Later (1819), he published the new name *Nidularia plumbea*, citing *C. olla*, which he had earlier validated, as a synonym. Although there are illustrations (Figs.9 —11) closely resembling *Crucibulum laeve* in his final work (Persoon, 1822), they are without a name, and there is no reference to either these figures or any other Gasteromycetes in the text.

Today, *Cyathus olla* and *C. striatus* are the two common European species of *Cyathus*, *Cyathus crucibulum* has been placed in a separate genus as *Crucibulum vulgare* (= *Crucibulum laeve*) and *Cyathus farctus* is treated under *Nidularia*. *Cyathus scutellaris* and *C. deformis* were inadequately described and have not been definitely recognized since.

Five collections are undetermined and 23 have the following names: *Cyathus farctus* (1), *C. fimetarius* (1), *C. griseus* (1), *C. laevis* (1), *C. leucospermus* (1), *C. nitidus* (1), *C. olla β. agrestis* s[eu] minor (1), *C. plicatulus* (1) and *C. striatus* (2), *Nidularia Domingensis* (1), *N. laevigata* (1), *N. laevis* (2), *N. leucosperma* (2), *N. plicata* (2), *N. plumbea* (1), *N. striata* (2) and *N. sylvestris* (1), and *Fungus parvus lamellatus pectunculus forma alba* [or: *albo*] *adnescens* (1). Four of these collections also have additional names:

the collection of *N. plumbea* bears the synonyms of *Cyathus olla* and *Nidularia vernicosa*; one of the collections of *Nidularia laevis* has the synonym *Cyathus crucibulum*; the collection of *Cyathus farctus* is annotated with the unpublished name "*Nidularia sphaeroidea*"; and the unpublished name "*Nidularia cubensis*" appears on the sheet of *Cyathus plicatulus*. Three collections are determined only as *Cyathus*.

It is probable that Persoon (1801) included in *Cyathus* all the species described by earlier authors which he considered sound. There is, however, no evidence to show that he had then actually seen material of these six species but he no doubt wished his monograph to be as complete as possible. It is also well-known that Persoon's basic work (1801) was written in Germany and, therefore, probably based on specimens collected in that region whereas his herbarium mainly dates from the later period when he was living in Paris. As I have previously indicated (Palmer, 1959), the collections now preserved at Leiden cannot be regarded as the types of the "Synopsis methodica fungorum" (Persoon, 1801), the starting point for the nomenclature of the Gasteromycetes, except in a few instances. However, they do show what Persoon meant by his names. Of course, this does not apply to the few species of Gasteromycetes which he published later. Persoon (1801) used the generic name *Cyathus* but later (1819) changed to *Nidularia*, no doubt following contemporary authors, and it seems likely that the collections determined as *Nidularia* were collected and named during the later period.

The presence of four definite and two probable West Indian, as well as two Mauritian, collections was unexpected although, on reflection, we should not be surprised that Persoon should also have retained curiosities which came his way. Whilst the European members of *Cyathus* seem to be few and fairly well understood, this cannot be said of the non-European species. Brodie & Dennis (1954) reviewed the Nidulariaceae of the West Indies and their short monograph, together with the works of Lloyd (1906) and Martínez (1956), has been of considerable assistance in studying Persoon's specimens.

The 31 collections can be placed in the three genera *Crucibulum*, *Cyathus*, and *Nidularia*, and comprise a total of eight species. Five species, *Crucibulum laeve*, *Cyathus olla*, *C. stercoreus*, and *C. striatus*, and *Nidularia farcta* are well-known for Europe but *Cyathus microsporus*, *C. poeppigii*, and *C. triplex* appear to be of tropical distribution.

TECHNIQUE.—The measurements of the peridia and peridioles were taken from perfectly dry specimens although some collections were initially soaked out to facilitate examination. Both structures shrink during the drying of fresh material and will expand again after wetting. The practice of examining microcharacters in Erythrosin Ammonia (Palmer, 1955) has been followed as this mountant quickly swells desiccated material and, as it also appears to inhibit the development of micro-organisms, slides can be preserved without any apparent deterioration. Microscopic characters are camera-lucida drawn and the formulae show minimum, average, and maximum measurements.

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I.—NOTES ON THE TAXA

CRUCIBULUM Tul.

Crucibulum Tul. *in* Ann. Sci. nat. (Bot.), sér. 3, **1**: 89. 1844.

Cup-shaped fruit-body with a single-walled peridium, mouth at first covered by an epiphragm and peridioles attached by a funiculus.

CRUCIBULUM LAEVE (Bull. ex DC.) Kambly apud Kambly & Lee

Cyathus crucibulum Pers., Syn. meth. Fung. 238. 1801.

Cyathus laevis Bull. *ex* DC., Fl. fr. **2**: 269. 1805.—*Crucibulum laeve* (Bull. ex DC.) Kambly *apud* Kambly & Lee *in* Univ. Iowa Stud. **17**: 167. 1936.

Cyathus fimetarius DC., Fl. fr. **5**: 104. 1815.

Crucibulum vulgare Tul. *in* Ann. Sci. nat. (Bot.), sér. 3, **1**: 90. 1844.

Cyathus leucospermus Pers. in Herb.—*Nidularia leucosperma* Pers. in Herb.—*Nidularia leucosperma* Pers. msc. in Herb. crypt. Par. cl. Thuill. nunc, cl. Ad. Brongniartii gr., Herb. Musaei Par. augenti, Tul. *in* Ann. Sci. nat. (Bot.), sér. 3, **1**: 90. 1844.

This is one of the commonest members of the Nidulariaceae in Europe and other temperate regions, although apparently unknown from the tropics, characterized by the greyish to purplish-black peridioles covered by a thick, persistent, creamy-white tunica and spores averaging 10 × 5 μ. The species is mainly found on wood-chips, twigs, etc., and dead herbaceous stems, but also occurs on other substrates such as old jute sacking and the dung of herbivores.

Collections on dung are far from common and, although *Cyathus fimetarius* has been retained as a distinct species by such modern authors as Cejp (1958), others have considered it a synonym of *C. laeve*. Lloyd (1906a) reported the type specimens of *Cyathus fimetarius* in De Candolle's Herbarium to be "*Crucibulum vulgare* growing on manure". De Candolle (1815) wrote: "Cette jolie espèce a été trouvée par M. Chaillet, à la fin de l'automne, sur la bouse des vaches". Therefore, it is very interesting to find a collection (L 910.255-610) determined as *C. fimetarius* and annotated by Chaillet in Persoon's Herbarium. It is possible that Chaillet passed part of his original collection to Persoon and Persoon's annotation "An satis diversus ab *Cyatho Crucibulo?*" shows that he was doubtful whether it was distinct.

"*Cyathus leucospermus*" or "*Nidularia leucosperma*" appear to be unpublished and are hence nomina nuda. The latter was cited by the Tulasnes (1844). The annotation

on L 910.255–632 refers to "Mycologia europaea" vol. 1, Fig. 9 (Persoon, 1822), which shows a bracket-like group of fruit-bodies on a twig. Killermann (1926) referred this figure to the present species under the synonym *C. vulgare*. As "*leucosperma (us)*" is not validly published, the epithet has no nomenclatural standing, but it can be conjectured that Persoon would have formally published it if he had been able to complete the "Mycologia europaea". L 910.255–632 comprises a group of aggregated fruit-bodies growing on a piece of decayed rope. The other two collections under this epithet are on woody substrates. All three are *Crucibulum laeve*.

Whilst the Tulasnes (1844) clearly described *Crucibulum vulgare*, by which name the species has been commonly known up to very recent times, Kambly (apud Kambly & Lee, 1936) pointed out that the valid name is *Crucibulum laeve*. There are three collections under the epithet "*laevis*", two of which, respectively placed under *Cyathus* and *Nidularia*, but without data, are *Cyathus olla*. The third, determined as "*Nidularia laevis* B.", also bears the synonym "*Cyathus Crucibulum*, Syn. fung." and is typical *Crucibulum laeve*.

CYATHUS Pers.

Cyathus Pers., Syn. meth. Fung. 236. 1801.
Nidularia Bull. *ex* J. St.-Hil., Expos. Fam. natur. germinat. Pl. 1. 1805.
Cyathia P. Br. *ex* V. S. White *in* Bull. Torrey bot. Cl. **29**: 255. 1902.

Cylindrical to cyathiform fruit-bodies with a 3-layered peridium, mouth at first covered by an epiphragm and peridioles attached by a funiculus.

Brodie & Dennis (1954) were the first to demonstrate that the species could be clearly separated on whether the peridioles had a single or a double-walled cortex, combined, of course, with spore sizes, etc. Lloyd (1906b) had indicated this structure when he stated in his synopsis of the sections of the genus *Cyathus* "Outer peridiole wall not strongly different from the inner" or "Outer peridiole wall thick, of coarse, colored fibrils". The exocortex is, of course, quite distinct from the tunica, absent in certain species, and comprises a very thin white or brown membrane, not always easy to see, which often disappears with age.

CYATHUS MICROSPORUS Tul.

Cyathus microsporus var. *domingensis* Tul. *in* Ann. Sci. nat. (Bot.), sér. 3, **1**: 73. 1844.
Nidularia domingensis Pers. in Herb.
Nidularia cubensis Pers. in Herb.

This species is stated to be distinguished from other small, dark brown species of *Cyathus* with a smooth or only faintly ridged endoperidium and a single-walled cortex by the very small spores, 6.6 × 4.4 μ (Tulasnes, 1844) and 5–6 × 4 μ (Brodie & Dennis 1954). The Tulasnes (1844) described their species *Cyathus microsporus* from two collections which they kept distinct as the two varieties, "α.

domingensis", collected on the Island of Hispaniola by Poiteau, and "*β. Berkeleyanus*" from Brazil. The variety *berkeleyanus* was raised to specific rank by White (1902) as *Cyathia berkeleyana* on account of its striate peridium leaving the variety *domingensis* as the type variety of *C. microsporus*.

The presence of the collection named "*Nidularia Domingensis*", whilst having spores averaging 8.6 × 5.4 μ, prompted me to borrow the type of *C. microsporus α. domingensis* from Paris. The sheet bears the words "*Cyathus microsporus α domingensis* Tul./St. Domingue/M. Poiteau" and has three groups of specimens attached to it. The two groups which macroscopically most closely resemble L 910.256–1582 ("*N. Domingensis*") have a tufted to felted, buffy- to snuff-brown exoperidium with the endoperidium buffy-fawn or grey-brown and lightly striate whilst the third comprises a single, externally tufted-hirsute, buffy-brown peridium with a smooth, buffy-grey endoperidium. The peridioles all have a black, one-walled cortex with a thin, buffy-brown tunica, sometimes missing, and spores 6.5–8–9.5 × 4.5–5.5–6.5 μ.

Cyathus microsporus was characterized by the Tulasnes (1844) as having small spores. However, according to the type these are no smaller than those recorded for *Cyathus pallidus* Berk. & Curt., said to differ by the light-coloured, fragile fruit-bodies with long, rigid hairs and, of course, the larger spores. Lloyd (1906b) gave *Cyathus hookeri* Berk. as having spores 6 × 8 μ although later (Lloyd, 1915) he thought that it should be considered a synonym of *C. microsporus*. Tai & Hung (1948) refer to *C. hookeri* a collection with spores 8–11 × 7–8 μ.

L 910.256–1582 is annotated "In Hispaniola", the West Indian island, today shared by the Dominican Republic and the Republic of Haïti, variously known as La Española, Santo Domingo and the Island of Hispaniola. The Tulasnes (1844) referred to both "in insula Haïti" and "individus recueillis à Saint-Domingue" in their discussion of Poiteau's material. According to Moscoso (1943), the French botanists A. Poiteau and J. F. Turpin collected in northern Haïti (Cabo Haitiano, Santa Susana and on the island Tortuga), with Turpin also collecting between Monte Christi and Santiago in the Dominican Republic, between 1796 and 1801. As there is also in Persoon's Herbarium a collection labelled "*Nidularia plicata*" which Poiteau found in Cayenne (French Guiana), it is possible that "*N. Domingensis*" was collected by Poiteau too, and might even be part of the type collection.

L 911.18–102, whilst bearing the name "*Cyathus plicatulus* mihi" (i.e. Gustav Kunze) as well as the herbarium name "*Nidularia cubensis* P.", is the same species.

CYATHUS OLLA (Batsch) ex Pers.

Cyathus olla (Batsch) *ex* Pers. *α. C. nitidus* (Roth) Pers. et *β. C. agrestis* Pers., Syn. meth. Fung. 237. 1801.
Cyathus vernicosus [Bull.] DC., Fl. fr. **2**: 270. 1805.
Nidularia plumbea Pers., Traité Champ. comest. 110. 1819.
Nidularia sylvestris Pers. in Herb.

A not uncommon species on herbaceous debris and, less frequently, on ligneous substrates in Europe, readily recognized by the typically flaring, internally smooth

and lead-coloured peridium, the massive peridioles 2–3 mm diam. with a one-walled cortex and a persistent tunica, and spores circa 10 × 7.5 μ.

Eight collections can be referred to *C. olla*, including single collections named "*Cyathus laevis*" and "*Nidularia laevis*" respectively, one with the herbarium name "*Nidularia sylvestris*" and two without a specific determination.

Figs. 1–10. Macroscopic view, nat. size

(The remaining specimens of importance were in too poor condition for drawing.)

Figs. 1–4. *Cyathus olla:* 1—(L 910.255–649, as *C. nitidus*); 2—(L 910.256–1377, as *C. olla β agrestis* s. minor); 3—(L 910.255–672, as *Nidularia plumbea*); and 4—(L 910.256–1636, as *N. sylvestris*).

Fig. 5. *Cyathus striatus* (L 911.34–54, as *C. griseus*).

Fig. 6. *Nidularia farcta* (L 910.255–658, as *Cyathus farctus?*).

Fig. 7. *Cyathus microsporus* (L 910.256–1582, as *Nidularia Domingensis*).

Fig. 8. *Cyathus triplex* (L 910.222–2897, as *Nidularia laevigata*).

Fig. 9. *Cyathus poeppigii* (L 910.222–2912, as *Nidularia plicata*).

Fig. 10. *Cyathus striatus* (L 910.261–39).

Persoon (1801) placed *Cyathus nitidus* Roth (1797) under *Cyathus olla* as "α. *Cyathus nitidus*" with the description "campanulatus, griseus tomentosus; striis (zonis) concentricis". L 910.255-649 bears the generic name "*Nidularia*" followed by "*Cyathus nitidus* Roth" and represents the typical form of *C. olla*. The endoperidium is now somewhat dark and certainly not as conspicuously zoned as the following.

A second taxon, "β. *Cyathus agrestis*", was included in *Cyathus olla* by Persoon (1801), with his description running "minor subhemisphaericus: margine erecto". L 910.256-1377, with the name "*Cyath. olla β. agrestis* s. minor" is a small form of *Cyathus olla*, which I have not previously seen, with a flaring mouth and a zoned interior, although the walls of one of the peridia seemed to become erect when it was soaked.

Nidularia plumbea was described by Persoon (1819) and, as both *Cyathus olla* and *Nidularia vernicosa* were cited as synonyms, was presumably intended to replace his earlier *C. olla*, probably as being a more appropriate name. L 910.255–672 is a form with a very broad mouth, much folded and longitudinally wrinkled. This appears to be what Lloyd (1906b) called *Cyathus anglicus* and Brodie (1952) reported from Argentina, England and the U.S.A. as *C. olla* forma *anglicus*.

CYATHUS POEPPIGII Tul.

Cyathus poeppigii Tul. *in* Ann. Sci. nat. (Bot.) sér. 3, **1**: 77. 1844.

A tropical species, this fungus is described as having the peridia externally dark-brown, shaggy or hirsute, sulcate both externally and internally, a double-walled cortex and large spores circa 33 × 23 μ.

The somewhat similar *Cyathus limbatus* Tul. is stated to have spores up to 22 × 12 μ. Although *Cyathus costatus* Lloyd (nomen nudum, see Stevenson & Cash, 1936) has large spores, circa 44 × 16 μ, it is only known from the type collection (on manure, Puerto Rico) and is said to be close to *C. poeppigii* but with the fruit-bodies about half the size and the striations of the peridia much coarser.

Nidularia plicata Fr. was described from Brazil with a somewhat scanty description. The Tulasnes (1844), who recombined the epithet as *Cyathus plicatus*, kept it distinct and described *C. poeppigii* as a new species, citing the exciccate "*Cyathus plicatulus* Pöpp. Plant. Cubenses exsicc., no. 47". In Persoon's Herbarium is a collection (L 911.18–102) annotated "*Cyathus plicatulus* mihi/in Pöppig pl. Crypt. Cubens. exsiccat. + En. pl. Cub. MSS/Cub. ad ligna vetusta sylvar./Kunze" which I refer to *Cyathus microsporus* Tul.

L 911.18–26 from Mauritius, under the name *Cyathus*, comprises a single fruit-body to this species although their peridia are rust-coloured. I have, however, been unable to find any spores in those peridioles which I have examined but Lloyd (1906b) mentioned that it is not uncommon to find the spores to be sparse or absent in the large-spored species, to which he considered it safe to refer sterile specimens.

CYATHUS STERCOREUS (Schw.) De Toni

Nidularia stercorea Schw. *in* Trans. Amer. phil. Soc. **4**: 253. 1834. — *Cyathus stercoreus* (Schw.) De Toni *in* Sacc., Syll. Fung. **7**: 40. 1888.
Cyathus lesueurii Tul. *in* Ann. Sci. nat., (Bot.), sér. 3, **1**: 79. 1844.

This species, whilst apparently uncommon in Europe, is world-wide in distribution and readily recognized by the externally shaggy peridium, smooth endoperidium, blackish, double-walled cortex without a tunica and large, subglobose or ellipsoid spores 30–35 μ. It is usually found on the dung of herbivores or rich soil.

L 911.18–26 from Mauritius, under the name *Cyathus*, comprises a single fruit-body with peridioles, which I refer to this species.

CYATHUS STRIATUS (Huds.) ex Pers.

Cyathus striatus (Huds.) *ex* Pers., Syn. meth. Fung. 237. 1801.
Cyathus hirsutus (Schaeff.) *ex* Quél., Enchir. Fung. 232. 1886.
Cyathus griseus Pers. in Herb.

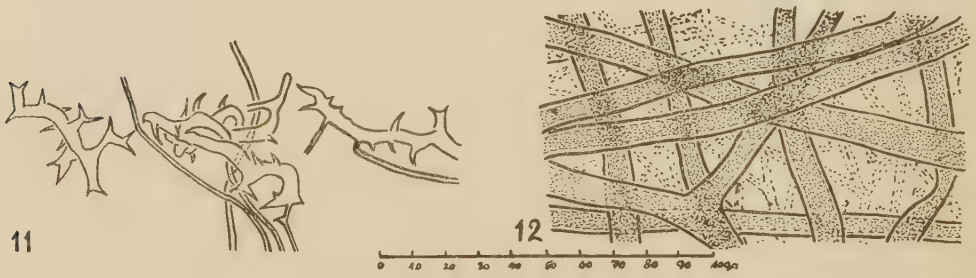
This well-known European species, characterized by the elongated brown peridia, usually densely hirsute externally and internally striate, with angular peridioles

covered by a light-coloured tunica and spores 19 × 10 μ, is represented by seven collections. There are two under *Cyathus striatus* and two under *Nidularia striata* as well as two unnamed collections.

The seventh, L 911.34–54, labelled "*Cyathus griseus*" and "sem. triquetra" belongs to this species. Although an unpublished name, "*C. griseus*" is interesting because of the reference to the triangular form of the peridioles, very typical for the species but only briefly referred to in the literature. The peridioles are also usually hemispherical in section with the under part often lobed and a deep umbilicus beneath.

The spores have very thick walls and are usually narrower towards the proximal end where a notch can be clearly seen when the median field of the horizontal spore is in focus. This feature does not appear to have been mentioned in the literature and could be used as an additional character in critical cases. A similar proximal notch has been observed in the spores of the specimens referred to *Cyathus triplex* Lloyd.

In most of the collections, particularly the more mature specimens, the exoperidium was usually distinctly sulcate.



Figs. 11–12. Microscopical characters

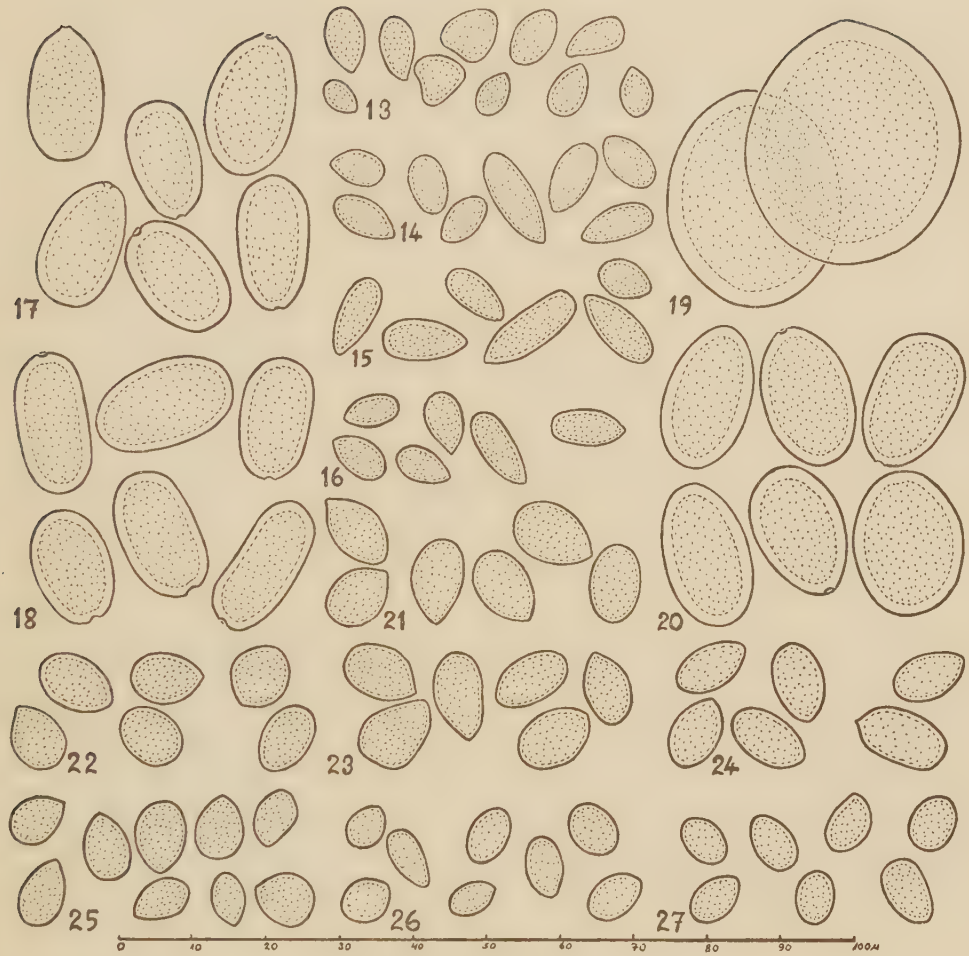
Figs. 11–12. *Nidularia farcta* (L 910.255–658, as *Cyathus farctus?*): 11—peridial hyphae; 12—cortical hyphae.

CYATHUS TRIPLEX Lloyd

Cyathus triplex Lloyd, Nidulariaceae 23. 1906.
Nidularia laevigata Pers. in Herb.

The species is recognized by the dark brown, strigose exoperidium, smooth to lightly plicate endoperidium, double-walled cortex and spores 16–22 × 12–14 μ. The peridioles are reported to have a thin, silvery tunica and the exocortex is stated not to be readily separable as, for instance, in *Cyathus stercoreus*. The spores in the present collections were observed to have a proximal notch similar to what I have found in the spores of *C. striatus*.

I refer L 910.222–2897 with the unpublished name "*Nidularia laevigata*" and annotated "(Cayenne)/(Intus laevis nec striata)" and L 910.255–669, which is



Figs. 13–27. Spores

Fig. 13. *Nidularia farcta* (L 910.255–658, as *Cyathus farctus?*).

Figs. 14–16. *Crucibulum laeve:* 14—(L 910.256–1389, as *Nidularia laevis*); 15—(L 910.255–610, as *Cyathus fimetarius*); 16—(L 910.255–632, as *C. leucospermus*).

Figs. 17–18. *Cyathus striatus:* 17—(L 910. 261–39); 18—(L 911.34–54, as *C. griseus*).

Fig. 19—*Cyathus stercoreus* (L 911.18–26, as *Cyathus*).

Fig. 20—*Cyathus triplex* (L 910.222–2897, as *Nidularia laevigata*).

Fig. 21–24. *Cyathus olla:* 21—(L 910.255–672, as *Nidularia plumbea*); 22—(L 910.255–649, as *Cyathus nitidus*); 23—(L 910.256–1377, as *Cyathus olla β agrestis* s. minor); 24—(L 910.256–1636, as *Nidularia sylvestris*).

Fig. 25–27. *Cyathus microsporus:* 25—(L 910.256–1582, as *Nidularia Domingenis*); 26—Type ex Herb. Paris; 27—(L 911.18–102, as *Cyathus plicatulus* Kunze and *Nidularia cubensis*).

undetermined, to this species. L 911.18-25, undetermined except for the generic name "*Cyathus*" and annotated "fig. 60/148/I. de Fr. [*]/ded. du Petit Thours" [* Mauritius], also appears to be referable to this species although the cinnamon-brown exoperidium is felted to lightly tufted. It is noteworthy that the type collection of *C. triplex* also came from Mauritius.

Lloyd (1906b) considered *C. triplex* a doubtful species because of its closeness to *C. intermedius* Tul. and *C. pallidus* Berk. & Curt.

NIDULARIA Fr.

Nidularia Fr., Symb. Gast., Fasc. 1: 2. 1817.

The genus is characterized by the globose fruit-bodies with the peridium wall constructed of irregular, rigid, spinose, ramose and long, simple, aseptate hyphae, and by the absence of an epiphragm and the free peridioles.

NIDULARIA FARCTA (Roth ex Pers.) Fr.

Cyathus farctus Roth *ex* Pers., Syn. meth. Fung. 239. 1801.—*Nidularia farcta* (Roth ex Pers.) Fr., Syst. myc. **2**: 301. 1823.
Nidularia confluens Fr., Symb. Gast., Fasc. 1: 3. 1817.
N. pisiformis [Roth] Tul. *in* Ann. Sci. nat. (Bot.), sér. 3, **1**: 95. 1844.
Nidularia sphaeroidea Pers. in Herb.

The species is characterized by the creamy-ochraceous peridium and free peridioles with a reddish-brown, one-walled cortex (wrinkled when dry) formed of loosely interwoven, sparsely branched, thick-walled, brown hyphae. It was originally hoped that authentic material would be found whereby the species could be typified.

L 910.255–658, determined as *Cyathus farctus* with a question mark, belongs to this species. The name "*Nidularia sphaeroidea*", which is unpublished, is appended in a hand which may be Persoon's. There is a similar collection in Fries's Herbarium at Uppsala with the name "*Nidularia farcta* (Roth) Fr." from "France" which is annotated "*sphaeroidea* Pers. in Litt./In Lignis abiegnis/Mougeot".

2.—PERSOON'S SPECIMENS

Although all specimens were firmly glued to the sheets, some were attached in such a manner that it was not possible to form any definite opinion as their taxonomic characters were obscured. Permission was received to soak off specimens where necessary, the most important of which have been remounted in transparent plastic boxes. In addition, many specimens were in poor condition whilst others, particularly those from the West Indies, were sparsely represented, which has hindered identification.

A further difficulty has been in both reading and recognizing the handwriting. Persoon's crabbed hand is obvious in most cases but some sheets have been annotated by Chaillet, Mougeot and other people. I am grateful to Drs. Dennis and Maas Geesteranus for their assistance in this respect.

L910.222–2897. —*Nidularia laevigata* (Cayenne)/(Intus laevis nec striata) [Persoon's handwriting].

A group of four fruit-bodies on a piece of wood. Fruit-bodies long cyathiform, 7.5–9 × 1–1.5 mm, tapering upwards to 3.5–4 mm; exoperidium of brown, tufted hyphae, somewhat abraded; endoperidium smooth to indistinctly ribbed, with ribs ca. 0.3 mm apart; peridioles 1.7–1.8 × 1.4–1.7 × ca. 0.4 mm, flattened disciform with a 2-walled (not readily separating), black and slightly wrinkled cortex with faint traces of a tunica; spores hyaline, ellipsoid, usually narrowing towards the proximal end, where there is an apical notch, very thick walls, 17–19.5–22 × 11–13–14.5 μ.

Redetermination: *Cyathus triplex* Lloyd.

L 910.222–2912.—*Nidularia plicata*/Cayenne (Poiteau) [Persoon's handwriting].

Eight loose fruit-bodies, each with a prominent emplacement, campanulate to cyathiform; exoperidium rust-coloured, felted and somewhat powdery with deep sulcations 0.3–0.6 mm broad for about one-third of the height; endoperidium sulcate; peridioles lenticular, grey-black, 2-walled, 1.9–2.3 × 1.7–1.9 × 0.3–0.5 mm. Spores absent from all peridioles examined.

Redetermination: Probably *Cyathus poeppigii* Tul.

L 910.255–610.—*Cyathus fimetarius* De Cand./An satis diversus ab *Cyatho Crucibulo?* [Persoon's handwriting]; *Cyathus fimetarius*/: 726a/9bre [Chaillet's handwriting].

Two rather squat and flattened fruit-bodies on vegetable debris resembling manure. Fruit-bodies 3.6–5.3 × 3–3.6 mm, with one fruit-body being little more than a rim embedded in the substrate bearing closely packed peridioles whilst the other fruit-body and its contents have been partly eaten away by animals; exoperidium ochraceous-yellow, felted; endoperidium creamy-ochraceous, smooth; peridioles 1.3–1.8 × 1.1–1.3 × 0.2–0.4 mm, lenticular, 1-walled, with a dull, purplish-black cortex obscured by a thick, loose, creamy-yellow tunica; spores hyaline, somewhat irregular in shape and size, varying from fusiform to ellipsoid, with prominent walls, 8–10–11.5 × 4.5–5–5.5 μ.

Redetermination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.255–632.—*Cyathus leucospermus*/Myc. Europ. t.1.f.9 videtur [Persoon's handwriting]; *Cyathus Crucibulum* Pers. S. 238. 3:/il me paroit tenir le milieu entre votre plante et le *fimetarius* C./Cable pourri/9bre. [Chaillet's handwriting].

A piece of decayed rope, as indicated by Chaillet, bearing a large cluster of closely aggregated fruit-bodies, 7–8 × 2–3 mm, tapering upwards to 5–7 mm, broadly cyathiform and thin-walled; exoperidium buffy-ochraceous, felted; endoperidium creamy-yellow, smooth; epiphragm whitish and gelatinous; peridioles 1.8–2.6 × 1.7–2.3 × 0.3–0.6 mm, disciform to ovate, 1-walled, with a purplish-grey cortex obscured by a thick, creamy-yellow tunica; spores hyaline, somewhat irregular in shape and size, long-ellipsoid with rounded ends, thick-walled, 7.5–9–10 × 4.5–5–5.5 μ.

Redetermination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.255–634.—*Fungus parvus lamellatus pectunculus forma alba* [or: *albo*] *adnescens*. Raj Syn. 14 N 27 T 10 F 7 minor Rotund/[the sheet of paper is cut off on the left-hand side and it is possible that one or more words have been lost, for instance "differt"] a *Clavaria* Roy [not Ray!]: minor s varitas [handwriting unknown; someone else has written on a tiny slip of paper: "ded. Raddi in hb. Pers."; it is impossible to find out if that is correct].

There are six fruit-bodies, including two pairs, without sign of the substratum, broadly tubular, ochraceous-brown and felted, with the peridioles covered by a thick, loose, whitish-ochraceous tunica and irregular spores, 6.5–11.5 × 4–5 μ.

Dr. Dennis informs me that the annotation is from Ray (1696) "No. 27 Fungus parvus . . . adnascens. Common in Woods in Ireland. Dr. Sherard" in the section headed "Fungi lamellati, terrestres et arborei" which, in Ray (1724), is placed under *Agaricus*.

Redetermination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.255–645 without determination.

Four fruit-bodies with traces of woody debris at their bases, cyathiform with flaring mouths and smooth, buffy-grey and zoned within, large peridioles (up to 2.7 mm diameter), 1-walled, and spores 8.2–14.2 × 5.7–9.3 μ.

Determination: *Cyathus olla* (Batsch) ex Pers.

L 910.255–648.—*Nidularia leucosperma* [Persoon's handwriting].

Three fragments comprising a piece of soil-caked wood bearing a part fruit-body, two fruit-bodies with a common wall, and a flattened fruit-body full of peridioles. Fruit-bodies 4 × 5 mm, more or less tubular; exoperidium ochraceous-cinnamon, felted; endoperidium ochraceous-yellow, smooth; peridioles 1.3–1.7 × 1.2–1.5 × 0.3–0.8 mm, disciform, funiculate, with a purplish-grey cortex covered by a thick, ochraceous-yellow tunica; spores hyaline, rather irregular in shape and size, varying from ellipsoid to broadly lanceolate, often with a prominent apiculus, 6.5–9.5–13.5 × 3.5–4.5–6 μ.

Redetermination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.255–649.—*Nidularia/Cyathus nitidus* Roth/Catal. bot. 1. p. 236 [Persoon's handwriting].

Four fruit-bodies with soil and woody debris at their bases, obconic, with mouths tending to flare and somewhat revolute; 10–12 × 1.5–2 mm, tapering upwards to 8–10 mm, exoperidium buffy-brown, slightly shaggy; endoperidium dark grey, smooth; peridioles 2.3–3.1 × 2.2–2.7 × 0.6–1.3 mm, irregularly lenticular with a 1-walled, black cortex obscured by a shiny, fawn-brown tunica; spores hyaline, typically broadly ellipsoid, usually narrower at one end, varying to ellipsoid, 9–9.9–11.2 × 6.4–7.5–8.5 μ.

Redetermination: *Cyathus olla* (Batsch) ex Pers.

L 910.255–658.—*Cyathus farctus* Pers.? / Voila une espece que jai trouvé cet Eté sur des bois pourri au bord des Eaux. Je partage avec vous mes Echantillons. Je n'ai garde pas autant que je vous en envoye. Je la rechercherai [Mougeot's handwriting]; *Nidularia sphaeroidea* [possibly Persoon's handwriting].

Four pieces of wood bearing fruit-bodies in different stages of development; fruit-bodies –7.2 × –5.7 mm, depressed globose, broadly seated, mainly immature and indehiscent but two irregularly opened; exoperidium more or less cinnamon-ochraceous, varying from densely pubescent to felted or almost smooth and constructed of rigid, spinose hyphae with the spines tapering into long, simple, aseptate threads, internally buffy-cream and smooth, with remains of gelatinous matrix containing hyaline, ramose hyphae with septa and clamp-connections adhering; peridioles free, 1.2–1.4 × 1.2–1.3 × 0.4 mm, lenticular, reddish-brown, with cortex formed of loosely woven, mainly simple threads, wrinkled when dry; spores hyaline, very irregular in shape and size but typically ellipsoid, usually narrower at one end, with prominent walls, 5.9–8.1–12.4 × 3.9–5–5.9 μ.

Redetermination: *Nidularia farcta* (Roth ex Pers.) Fr.

L 910.255–668 without determination.

Ten single fruit-bodies with soil and debris adhering to their bases, long cyathiform, externally brown and hirsute, internally sulcate; peridioles angular, 1-walled; spores 17.3–20.5 × 9–11.2 μ.

Determination: *Cyathus striatus* (Huds.) ex Pers.

L 910.255–669 without determination.

Eleven fruit-bodies with mycelium, soil or wood at their bases, 6–9.5 × 1–2 mm, tapering upwards to 4–6 mm, narrowly cyathiform; exoperidium purplish-brown, with densely tufted hyphae; endoperidium dark grey, faintly striate; peridioles 1.6–2.2 × 1.5–1.9 × 0.4–0.5 mm, disciform, with a dull black cortex, wrinkled or minutely pitted, 2-walled but not readily separating, with traces of a very thin, evanescent tunica; spores hyaline, broadly ellipsoid, usually pointed at one end, with very thick walls and a notch in the proximal end, 18.7–19.7–20.7 × 12.4–13–14.3 μ.

Determination: *Cyathus triplex* Lloyd.

L 910.255–672.—*Nidularia plumbea* / — *vernicosa* B. / *Cyathus olla*, Syn. fung. [Persoon's handwriting].

Eight single fruit-bodies with several bearing small nodules of soil at their bases and one with a few sand grains adhering to the exoperidium, 7.5–11 × 1–2 mm, tapering upwards to 8-15 mm, broadly cyathiform, much flared with longitudinally folded and wrinkled mouths; exoperidium fawn to dark grey, smooth; peridioles 3.1–3.7 × 1.8–3.1 × 0.5–1 mm, very irregularly disciform, 1-walled black cortex obscured by a buffy-brown and persistent tunica; spores hyaline, broadly ellipsoid to pip-shaped, usually narrower at one end, 9.6–11.7–14.7 × 6.2–7.5–9.3 μ.

Determination: *Cyathus olla* (Batsch) ex Pers.

L 910.255–685 without determination.

Seven fruit-bodies on two pieces of vegetable material, possibly dung of herbivore, distorted and tubular, dirty ochraceous and felted, with peridioles covered by a thick, creamy-yellow tunica and spores irregular in shape, 6.5–9.6 × 4–5.6 μ.

Determination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.255–890 without determination.

Seven fruit-bodies, including one pair with soil and mycelium adhering, long cyathiform; exoperidium brown, densely tufted; endoperidium sulcate, spores 17.1–23.3 × 9.7–12.1 μ.

Determination: *Cyathus striatus* (Huds.) ex Pers.

L 910.255–892.—*Cyathus laevis* [Persoon's handwriting].

Nine fruit-bodies, including one attached to a piece of wood and five with white, ramose rhizomorphs attached to their bases, up to 1 cm tall, cyathiform; exoperidium buffy-brown and varying from felted to shaggy; endoperidium greyish-brown, smooth; peridioles up to 3.2 × 2.7 mm, irregularly disciform with a thin brown tunica; spores variable in shape and size, subglobose to ellipsoid with one end narrower, 8.4–10.3–12.1 × 6.2–7.4–9.6 μ.

Redetermination: *Cyathus olla* (Batsch) ex Pers.

L 910.256–1377.—*Cyathus olla β. agrestis* s. [= seu] minor / Ex Sicilia [Persoon's handwriting].

Five fruit-bodies, including one pair, with traces of soil and unidentifiable debris adhering to them, 4–6.5 × 1–2 mm, tapering up to 6–8.5 mm, very broadly cyathiform with a flared and flattened, wavy mouth but somewhat erect in one specimen; exoperidium buffy-ochraceous, felted shaggy; endoperidium buffy-brown, smooth, with a zoned rim and somewhat darker within; peridiole (only one remaining) 2.1 × 1.8 × 0.8 mm, lenticular, ovate, with a 1-walled black cortex obscured by a brown tunica; spores hyaline, variable in shape and size but usually ellipsoid, pointed at one end, with prominent walls, 8.1–11.1–14 × 6.2–6.8–7.9 μ.

Determination: *Cyathus olla* (Batsch) ex Pers.

L 910.256–1387.—*Cyathus* / Prope Belleville (Paris) sub *Seringa vulgari* [Persoon's handwriting].

A mossy twig bearing a closely developed group of three fruit-bodies and two loose fruit-bodies, one with soil at the base, with a mat of buffy mycelium surrounding the fruit-bodies on the twig, 4.8–7.5 × 2–3 mm, tapering to 6.5–9.5 mm, shortly broadly tubular with a flared or flattened mouth; exoperidium smooth, dirty-grey or blackish-brown; peridioles to 2.3 × 2.2 mm, lenticular to disciform, with a thin, closely adhering buffy-brown tunica and a black cortex beneath; spores 10.9–11.9–13.2 × 6–6.5–7.6 μ.

Determination: *Cyathus olla* (Batsch) ex Pers.

L 910.256-1388.—*Nidularia leucosperma* / Gallia / Prope Parisios [Persoon's handwriting].

A twig bearing a small, dense cluster of fruit-bodies and a branch or chip-end with about ten densely clustered, flattened fruit-bodies, to 6 mm tall, somewhat shortly cylindrical with some appearing to have common walls; exoperidium buffy-ochraceous, felted; endoperidium buffy-brown, smooth; peridioles to 1.9 mm diameter, disciform, with a thick, creamy-yellow tunica and a purplish-grey cortex beneath; spores hyaline, rather variable in shape and size, varying from ellipsoid, when usually tapering to one end, to fusiform or naviform, with distinct walls, 7.9–10.3–14 × 4.2–4.8–5.6 μ.

Redetermination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.256–1389.—*Nidularia laevis* B. / *Cyathus Crucibulum* / Syn. fung. / (Vogesia) [Persoon's handwriting].

Four pieces of wood bearing six somewhat insect-attacked fruit-bodies, up to 6 mm tall, broadly cyathiform, broadly based, with a scurfy, cinnamon epiphragm persisting; exoperidium ochraceous-cinnamon and felted; endoperidium buffy-fawn and smooth; peridioles up to 1.7 mm diameter, disciform, with a thick, loose, creamy-ochraceous tunica and a purplish-grey cortex beneath; spores hyaline, somewhat irregular in size and form, mainly ellipsoid, often rounded at both ends but sometimes tapering to one end, to fusiform or naviform, with distinct walls, 7.7–8.8–10.9 × 3.9–4.6–5.3 μ.

Determination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.256–1571.—*Nidularia striata* [Persoon's handwriting]; leg. Junghuhn. Germania [unknown handwriting].

A confused mass of fruit-bodies and vegetable matter; peridia cyathiform to tubular; exoperidium dark brown and strongly tufted; endoperidium sulcate with somewhat triangular peridioles; spores hyaline, oblong with rounded ends, usually narrower towards one end where there is a distinct proximal notch, very thick walls, 17.1–20.7–23.5 × 9.9–12.8–16.8 μ.

Determination: *Cyathus striatus* (Huds.) ex Pers.

L 910.256–1582.—*Nidularia Domingensis* / In Hispaniola [Persoon's handwriting].

Four loose fruit-bodies on wood with a basal mycelial emplacement, 6.5–8.3 × 0.5–1 mm, tapering upwards to 6–8 mm, obconic to cupulate, exoperidium ochraceous-brown and felted with occasional tufts (possibly partly denuded); endoperidium buffy-brown, varying from smooth to very faintly striate; peridioles 1.8–2.3 × 1.7–2.1 × 0.2–0.5 mm, disciform, often irregular and wavy, with a dark, buffy-brown tunica and a blackish cortex beneath, 1-walled; spores hyaline, very irregular in shape, varying from ellipsoid to subglobose, very occasionally angular to broadly pip-shaped and tapering towards one end, with a distinct wall, 7.4–8.6–10.1 × 5–5.4–7.3 μ.

Redetermination: *Cyathus microsporus* Tul.

L 910.256–1636.—*Nidularia sylvestris* / var. *Cyathi ollae?* / In Fruticetis (*Seringae vulgaris*) ad stipites s. ramulos dejectos. / Autumno 1816. / Prope Belleville [Persoon's handwriting].

Two loose fruit-bodies and a piece of wood bearing a single fruit-body, 5–8.5 × 1–1.5 mm, tapering up to 6.5 mm, cyathiform to slightly flaring, with a basal emplacement; exoperidium buffy-brown and varying from felted to sparsely tufted with long brownish filaments; endoperidium buffy-brown and smooth; peridioles up to 2.2 mm diameter, lenticular, with a purplish-brown, wrinkled tunica and a black cortex beneath; spores hyaline, somewhat variable in shape but mainly ovate with blunt ends, occasionally subglobose, with distinct walls, 9–10.4–12.1 × 5.9–6.8–9.6 μ.

Redetermination: *Cyathus olla* (Batsch) ex Pers.

L 910.261–36.—*Cyathus striatus* [Persoon's handwriting].

Five loose fruit-bodies with soil-encrusted mycelial emplacements, up to 11.5 mm tall, obconic to almost tubular, rounded above when young and densely covered with shaggy, brown, tufted hyphae, with sulcations apparent in the older specimens; endoperidium sulcate; peridioles 1.7–2 mm diameter, irregularly lenticular to almost triangular, with a buffy-brown tunica and a black cortex beneath; spores hyaline, oblong with blunt ends, slightly tapering towards one end where there is a proximal notch, thick walls, 18–19.4–22.2 × 9.1–10.3–10.9 μ.

Determination: *Cyathus striatus* (Huds.) ex Pers.

L 910.261–38.—*Nidularia striata* [Persoon's handwriting].

Eight loose fruit-bodies with large emplacements of fibrous material at their bases, up to 15 mm tall, long cyathiform; exoperidium densely covered with shaggy tufts of dark-brown hyphae through which the sulcations are readily seen; endoperidium sulcate; peridioles ca. 1.8 mm diameter, irregularly lenticular to almost triangular, with a buffy-brown tunica and a shiny black cortex beneath, 1-walled; spores hyaline, oblong with rounded ends, often tapering towards the proximal end, where there is an indistinct notch, very thick walls, 15.8–18.5–20.4 × 8.2–10.3–12.1μ.

Determination: *Cyathus striatus* (Huds.) ex Pers.

L 910.261–39.—*Cyathus striatus.* / cum radiculis longis villosis fungum quemdam byssoideum mentientibus. [Persoon's handwriting].

Three rather battered fruit-bodies on woody debris with basal debris encrusted emplacements, 8–9.5 × 1.5–2.5 mm, tapering upwards to 3–8 mm, long cyathiform; exoperidium densely covered with shaggy tufts of dark-brown hyphae through which the sulcations are readily seen; endoperidium brown, sulcate; peridioles 1.5–2 × 1.4–1.6 mm, very irregularly lenticulate, varying from angular to almost triangular with traces of a fawn tunica and a 1-walled black cortex beneath; spores hyaline, oblong with rounded ends, tapering towards the proximal end, where there is an apical notch, thick walls, 15.8–18.6–21 × 9.3–10.7–11.2 μ.

Determination: *Cyathus striatus* (Huds.) ex Pers.

L 910.261–41.—*Nidularia plicata* [Persoon's handwriting].

Fourteen fruit-bodies, including one with traces of woody substratum and several groups of two or three individuals, up to 8 mm tall with a prominent emplacement, broadly obconic, often upwardly curving; exoperidium reddish-ochraceous and appearing to be coated with a fine powdery deposit, with deep sulcations for about one third of the height, both outside and within; peridioles up to 2.1 mm diameter, flattened disciform, lightly corrugated and dull purplish black with a 2-walled cortex. No spores could be found although several peridioles were examined.

Redetermination: Probably *Cyathus poeppigii* Tul.

L 911.18–25.—*Cyathus* / fig. 60 / 148 / I. de Fr. [Persoon's handwriting]; ded. du Petit Thours [handwriting unknown].

A single fruit-body 6.5 × 0.5 mm, tapering to 5 mm at mouth, broadly obconic; exoperidium cinnamon-brown, felted to lightly tufted; endoperidium buffy-grey and lightly striate; peridioles up to 2.2 mm diameter, lenticular, with a somewhat wrinkled buffy-brown tunica persisting in places and a 2-walled, inseparable, black, wrinkled cortex; spores hyaline, varying from oblong with rounded ends to ellipsoid with a distinct proximal notch, thick walls, 15.7–17.7–20.5 × 10.3–11.6–12.6 μ.

I consulted Dr. Dennis regarding the annotations on both this and the following collections. He pointed out that "I. de Fr." (L'Ile de France) was the name of Mauritius before it was captured by the English and that Aubert du Petit Thours was a French traveller and botanist of the Napoleonic era who published a good deal about Madagascar, Mauritius, etc. He was, however, unable to find the figures referred to in any of du Petit Thours' publications in the Kew library.

Determination: Probably *Cyathus triplex* Lloyd.

L 911.18–26.—*Cyathus* [followed by an illegible letter] / 60/147/I. de Fr. [Persoon's handwriting]; ded. du Petit Thours [handwriting unknown].

A single fruit-body, 5 × 1.5 mm, tapering upwardly to 3.2 mm, broadly cyathiform with slightly upwards tapering sides and a somewhat irregular mouth; exoperidium fawn-ochraceous, with matted, tufted hyphae; endoperidium smooth, dark greyish-brown; peridioles up to 2.1 mm diameter, disciform, with externally very dark brown, 2-walled cortex; spores hyaline, broadly ellipsoid to subglobose, with very thick walls, 26.5–30.8–35.7 × 23.3–27.8–32.4 μ.

Determination: *Cyathus stercoreus* (Schwein.) De Toni.

L 911.18–102.—*Nidularia cubensis* P. [Persoon's handwriting]; *Cyathus plicatulus* mihi in Pöppig, pl. Crypt. Cubens. exsiccat. + En. pl. Cub. MSS. / Cub. ad ligna vetusta sylvar. / Kunze [Gustav Kunze's handwriting].

A long sliver of wood bearing two fruit-bodies with mycelial emplacement of a third remaining. Fruit-bodies developing from a dark, prominent, circular emplacement about 2.8 mm diameter, 4.2–6 × 1.2–1.5 mm, tapering upwards to 6.7 mm, cyathiform but rounded below; exoperidium of reddish-brown hairs, weathered away in part and darker below; endoperidium greyish-fawn, smooth with a few longitudinal wrinkles to very faintly striate; peridioles 1.6–1.9–2.2 ×

1.3–1.6–1.7 × 0.3–0.4 mm, irregularly lenticular with a very thin, purplish-brown tunica and a black, 1-walled cortex beneath; spores hyaline, ellipsoid, usually pointed at one end, with prominent walls, 7.7–8.3–9.5 × 4.8–5.5–6.2 μ.

Redetermination: *Cyathus microsporus* Tul.

L 911.18–490.—*Nidularia laevis* [Persoon's handwriting].

Three fruit-bodies with a few moss fragments on one, to 11.3 mm tall, obconic, with a broad mouth tending to flare; exoperidium buffy-ochraceous and felted; endoperidium smooth and buffy-grey; peridiole (single one remaining) 3 × 2.7 mm, lenticular, with a loosely adhering, thin, purplish-brown tunica and a black cortex beneath, 1-walled; spores hyaline, rather irregularly pip-shaped to broadly ovate, narrower at one end, with prominent walls, 9.8–11.4–12.4 × 6.5–7.4–8.2 μ.

Redetermination: *Cyathus olla* (Batsch) ex Pers.

L 911.34–54. —*Cyathus griseus.* / Sem. triquetra. / Prope Parisios lectus [Persoon's handwriting].

A single fruit-body with a prominent mycelial emplacement, 9 × 1.5 mm, tapering upwards to 6.5 mm, cyathiform; exoperidium of coarse, medium brown hairs; endoperidium buffy-grey and lightly sulcate above; peridioles irregular, often ± triangular, with faint traces of a fawn tunica on underside and a black, 1-walled cortex; spores hyaline, oblong, with rounded ends, to ellipsoid, usually tapering to proximal end, where there is a prominent notch, thick walls, 17.1–19–23.3 × 8.5–10.5–12 μ.

Redetermination: *Cyathus striatus* (Huds.) ex Pers.

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